

What is an environmental history of information? The act of tagging the commons invites this question. Many kinds of markings reveal the city as a collective cultural work. They also trace the remarkable diversification of information technology. So in its explorations of the ambient, this inquiry now turns from the subjectivity of attention to the objectivity of information in the built environment, and, where possible, to its history.

This begins with the tag. There is no simpler piece of situated technology. Although overtly semantic itself, a tag quickly shifts attention to the intrinsic structure of whatever it labels. Tags are simpler and possibly more prevalent than screens, which are the assumed focus in today's economics of attention. Whereas the contents of a screen are disembodied and usually disengaged from context, a tag is almost always about something right here. More basically still, a tag is physically inscribed and not sent.

Once upon a time, the ancients stood stones in an enchanted landscape. Later on, emperors chiseled proclamations into marble

facades. Opposing street gangs scrawled slogans on walls in the night. Shopkeepers washed down the sidewalks each morning, then put out menus of the day's wares. Barkers pushed broadsides, often literally in your face. Prefects and police posted notices and regulations. Commissions installed commemorative plaques. Soldiers and sailors proudly flew their colors. Portraits of Lenin and Stalin hung over apparatchiks' desks. Fresh batik draped over old statues of Ganesh. Crosses and crescents glinted in the sun atop spires. And more recently, bank logos glowed atop skyscrapers through the night. Advertising campaigns advanced onto all manner of surfaces that formerly lacked inscriptions. Teenagers spray painted tags around town, likewise building their brand.

Digital media now transform these tales. Tagging has turned technological, from huge programmable facades to wearable fashion accessories to tiny radio frequency identification (RFID) chips. A new kind of information commons, different from those in disembodied electronic cyberspace, may be taking form at street level.

Architects again admit of signage and ornament. Planners make policies about light pollution and mobile noise. Information designers build wayfinding systems for use on handheld gadgets. Interaction designers seek delight in embodied social navigation. These design and cultural opportunities may rival those of any past era of technological change, such as electrification a century ago. The cultural costs could well surpass those of other ages as well, even those of automobiles to cities.

Situated technologies may not dominate everyday conceptions of information technology beyond smartphones and screens. Surveillance usually draws more concern. Big data

clouds now draw the most business hype. More basic concerns about digital divides in supposedly ubiquitous Internet access precede more abstract concerns about ambient information. In other words, the cultural shift from what was called "cyberspace" (a quaint word by now) to pervasive computing seems only partial. Obsession with mobile smartphones masks an equally important design challenge of embedded sensors, data, and processing. So let the simple tag stand for the fact that there are situated technologies, too.

Beginning from the simplicity of the tag, let this inquiry take a topological survey of the expanding contexts and formats of information that are so altering the nature of attention. Consider tags as points, glowing surfaces as areas, architectural space and atmospheres as volumes, and urban resources as networks. To explore how the ambient becomes a reality and its design and governance become cultural necessities, begin from a timeless, everyday, and utterly local act: writing on the walls.

Urban Markup Languages

The simple act of marking the city reveals larger cultural aspects of the commons. To explore such aspects, consider, for example, the simple sticker. More so than its meaner aerosol counterparts, adhesive art seeks some shared cultural ground.

Indeed, the adhesive tagger Shepard Fairey, creator of Obey Giant, of which some half million instances were once said to exist,¹ and of the memorable red-and-blue Barack Obama campaign poster, whose imitations and mockeries seemed to rival the Giant in their ubiquity, was for a time considered the most eminent visual artist in the United States. In an illustration of how motifs and tastemakers cross cultural borders, the Institute

for Contemporary Art in Boston marked the occasion of the Obama inauguration with an exhibition on Fairey, and with a Giant on its facade (figure 6.1).

On the street, a tagger is someone who signs in aerosol. To tag is to spray paint your name. Most people consider aerosol signing to be antisocial, and many cities have made it a crime. Yet among insiders, aerosol signing provides what an information professional might call a “reputation system.” Anyone who can sign all over town without getting caught in the act must be a “badass.” At some animal level, in the realm of embodied cognition, tagging just marks territory, without civic aspiration. But then it becomes social—defiantly in its choices of site, competitively in which tags are respected and not soon written over by rivals, and culturally in how some signs become noticed by the general public and even appreciated by critics. Why else would so many art museum gift shops offer coffee-table catalogs of graffiti?

Graffiti.org, the most-linked compendium of curatorial-minded graffiti enthusiasts, called itself “Art Crimes.” Washington’s arbiters of art have said otherwise, however: “Large graffiti pieces are also on display in the ‘hallowed halls’ of the National Portrait Gallery.”² Yet before curators official or unofficial step in, the corporate coolhunters have already been through. Taste-making mines street culture first. It is difficult to make cultural generalizations about the street, where there are as many styles as there are taggers. For present purposes, it is fair to assume that conflation of art, crime, curation, hyperlinking, and online tagging of sampled street art only adds to how many ways, and to how many different sets of eyes, fresh markup stays hip. “I think we owe everything to the Internet,” traffic sign modifier Dan Witz has observed.³



6.1 Obey Giant on the Institute of Contemporary Art (ICA) building, Boston, 2009. Photo: Joe C./www.random-pattern.com.

The aggregate of so many tags on the street is more problematic, however. Citywide, rampant graffiti indicate distress, and tend to invite other troubles. Anyone who remembers New York in the 1970s will know this to be true.⁴ There the graffiti reached an unprecedented scale, most memorably covering almost all subway cars (figure 6.2). In response, subway rail yards got fenced in concertina wire, wide-nibbed markers were taken off the market, and penalties for aerosol signing began to escalate.⁵

As New York's recovery from its troubled conditions of the 1970s made clear, one of the most useful public policies is to fight any appearance of anomie. It is important to assert the existence of a commons. This position was made memorable by the theory of "broken windows," introduced in the early 1980s: "Social psychologists and police officers tend to agree that if a window in a building is broken and is left unrepaired, all the rest of the windows will soon be broken. . . . Vandalism can occur anywhere, once communal barriers—the sense of mutual regard and the obligations of civility—are lowered by actions that seem to signal that 'no one cares.' . . . Such an area is vulnerable to criminal invasion."⁶

Among the side effects of New York's cleanup, more interesting variants of tagging appeared. Adhesive art or "slap tagging," for instance, Shepard Fairey's medium, took off with "Hello My Name Is _____" stickers, normally used for casual business receptions. Today the "I Wish This Was _____" sticker uses the same visual format for suggesting street-level improvements.⁷ Stickers had a past in posters, of course: long before electronic media, posting lithographic bills was the main form of advertising. Thus most cities have rules about flyposting. But compared to spraying, stickering makes it easier to hit more locations, and easier to stay out of jail.⁸ Still less risky is "reverse graffiti," a new genre of erasure, which helps owners remove grime from their walls. Such noncriminality has helped move street art beyond teen angst and into the cultural mainstream, such as museums.⁹ Stylistically, there is something in the air that favors urban markup.

The rise of electronic tagging may not hurt this. Many people and organizations of respectable means now have their



6.2 Graffiti on New York subway cars, 1973. Photo: Erik Caloniou, EPA.

own use for the word. To tag is to insert keywords into content, for example, as when photo sharing in FlickrR. Lately, the most fashionable format has been the hashtags of Twitter. More generally, tagging implies all manner of metadata: smaller identifiers for larger pieces of information. The openness is one reason why tagging has exploded in popularity. Anyone can make up a keyword, and there is no such thing as a wrong tag. And now with GPS location data, RFID identity tagging, and augmented city smartphone overlays like Layar catching on, a new middle ground of tagging has come into being.

The curatorial prospects seem huge, far beyond what museums have done with purely physical tagging. Bottom-up tagging

online has great potential for emergent effects. As of 2012, the augmented reality business appeared ready to explode.¹⁰ Whatever may happen, the complex patterns that arise from very large numbers of very simple elements may eventually stabilize into enduring relationships, and useful classification schemes.¹¹ That, in turn, provides an excuse for going out on the town.

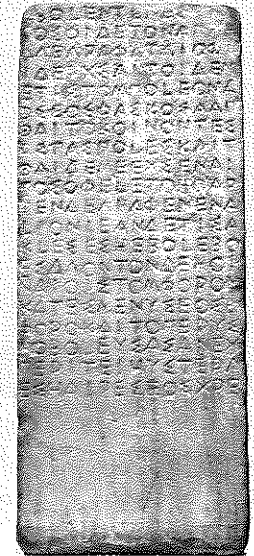
Carved Inscriptions

Stickers don't last the way carved marble does. The arts of urban markup differ not only by intended effect, but also by duration. To "set it in stone" means to leave something for the ages. Stone still has clout, even in a media-saturated age. Of bygone eras when written communications were scarce, one can only imagine the power of a proclamation chiseled into a stele or portico.

The discipline of epigraphy studies the messages found in archaeological remains, usually in stone. This has long been important to classical studies. Universities had epigraphers before they had architects. Epigraphers must interpret findings against whatever else is known about a culture through other means in order to establish enough context to make sense of tags. Necessarily short tags "tend to omit pertinent information that is already known by the intended audience," observed epigrapher Bradley McClean,¹² who listed eighteen categories of stone markings commonly found in classical Mediterranean cultures (figure 6.3).

Architecture has often provided both physical and cultural context for making sense of inscriptions. Architectural historians assert how, long before print, the inscription and ornament of buildings provided an effective information medium. For example, the facade of a church could at once, through its iconography, educate the laity—perhaps also providing a pulpit from

1. Decrees, laws, treaties, official letters
2. Honorific decrees, proxeny decrees, and honorific inscriptions
3. Dedications and ex-votos
4. Prose and metrical funerary inscriptions
5. Manumission inscriptions
6. Other legal instruments of common law
7. Boundary stones
8. Milestones
9. Herms (pillars to Hermes)
10. Sacred laws
11. Other sacred inscriptions
12. Inscriptions on public and private works
13. Accounts and catalogs
14. Inscriptions on portable objects
15. Quarry and masons' marks
16. Inscriptions in metal
17. Graffiti
18. Artists' signatures



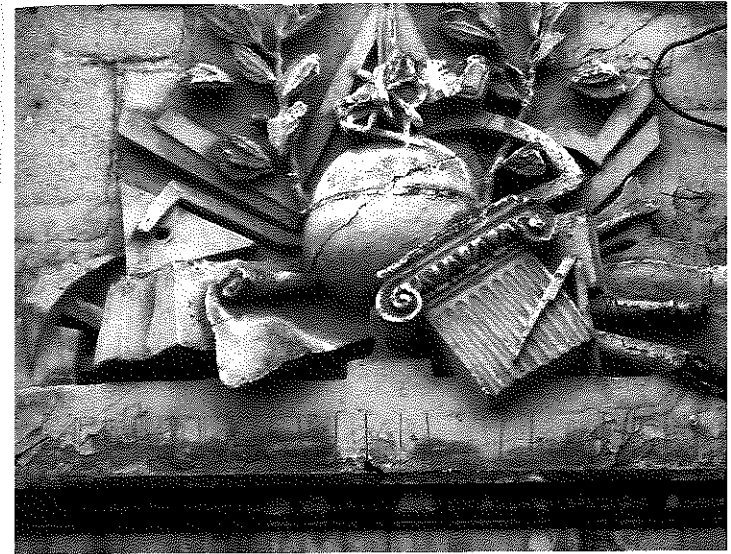
6.3 Categories in classical epigraphy (source: Bradley McLean.) Background: stele, with decree of phoros (tribute) to Delian League (447 BCE). Photo: Marie-Lan Nguyen/Wikimedia Commons.

which the clergy might speak—and, through its magnificence, stand as a visual sign of the aspirations of the society that built it. Of course, cultures differed in how their sacred structures performed this didactic role, whether through tags and texts, images and imposing facades, or meaningful sequences of spaces; some

structures were fairly covered in script. It is an oft-cited story in the history of architecture how print usurped this role. "Architecture is the great book of humanity," Victor Hugo famously lamented on the rise of print, "Gutenberg's letters of lead are about to supersede Orpheus's letters of stone."¹³

Although the Victorian city was full of everyday print uses like none before it,¹⁴ the arts of inscribing stone continued, and even increased for a time, especially with respect to architectural ornament. Steam-powered industrial machines made the rough work much easier, which gave skilled stone carvers time for more of the projects that slowly changing cultural tastes still demanded. Medallions, swags, and sgraffites ornamented holy and unholy edifices alike (figure 6.4). This produced an overload in its own right: fine ornamental motifs were executed more often (now outside of traditional cultures) just because it had become technically feasible. As crude new technologies served ornate tastes still shaped by previous handicraft sensibilities, the results were especially ponderous. Not only in buildings, but also in clothing and the decorative arts, overdone ornament became the signature of the Victorian age, at least as seen in retrospect from the twentieth century, after skills and tastes had changed.

Today, a single gravestone, one of the few remaining instances of tagging for the ages, can cost thousands. To fund the carving of a simple dedication in the cornice of a building takes the resources of a state or, at least, a grand public institution. The artisans who carved stone for the Beaux-Arts libraries, concert halls, and museums of the industrial city aren't so numerous now. In the recent past, you could find a few at work on the Cathedral of Saint John the Divine, in New York, where they were supported by diamond-edge digital gang saws that did



6.4 Trade inscription for an architect's office, Paris.

all but the finish work; more recent advances in robotic water jet cutting are renewing the art of stone cutting, but only in a handful of studio cultures.¹⁵

Official, exclusive, and enduring, stone is graffiti's pure opposite. Except the two do share one trait: relationship to a commons.

Rampant Signage

Most official inscription today supports what matters most: moving about safely. To alter traffic and safety instructions on your own could be just as much of a crime as aerosol signing.

Standardized instructional signage didn't always exist. Consider its rise in Paris, for example. In her influential history of the city as text, Priscilla Ferguson explained the early nineteenth-century program of naming and charting the whole of Paris: "That streets should have names is not self-evident. For centuries, most villages and towns felt no need to name their streets, and even today a major urban center like Tokyo manages to do without them."¹⁶ This naming program was a major reconceptualization. "Street names and other symbols, [Abbé] Gregoire reminded the Assemblée Nationale, provided the Revolution with means to do what no regime had ever done—institute reason and popular sovereignty."¹⁷ Contrary to popular misconceptions about their neutrality, tagging systems exist with a purpose, by and for particular constituencies. Not everything gets tagged, and systems and selections of tags define and shape the groups they serve. Writing about the rise of guidebooks, but with implications for other uses as well, Ferguson observed how publishers felt that "unmediated contact with the city is inadequate at best, and probably dangerous as well."¹⁸

Today a small industry in environmental graphics serves these needs. In America, the Society of Environmental Graphic Design (SEGD) claims 1,600 members, who work on "wayfinding systems, architectural graphics, signage, exhibit design, identity graphics, dynamic environments, civic design, pictogram design, retail and store design, mapping, and themed environments."¹⁹ Yet members of many other disciplines have also engaged in these pursuits. Environmental graphics was a growth industry long before digital location tagging became widespread. Just look at all the signs going up lately to proclaim what once was obvious to all. "If the door is closed, do not enter," one sign

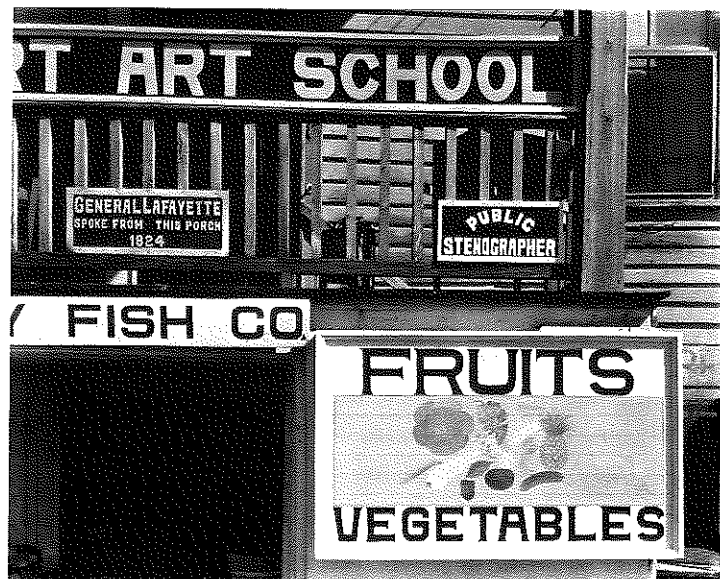
parody reminded, at the 2009 Edinburgh Festival Fringe.²⁰ Operational and safety instructions nearly rival advertisements in their ubiquity.

Instruction occasionally operates with intrinsic structure instead of placard signage. For example, California color codes its curbs in paint to indicate parking restrictions. In Germany, differences in surface texture remind bicyclists and pedestrians which band of the sidewalk to use.

Officialdom sometimes even operates in aerosol. Thus construction crews spray color-coded arrows on the pavement to indicate utility lines below. When the phrase "urban markup" was catching on among digerati, who would (unofficially) "war-chalk" free Wi-Fi hotspots for one another's benefit, *Wired* magazine ran a piece on pavement spray tags:

If you know the lingo, you can visualize the dense architecture that sprawls beneath our streets. The paint colors are fairly standard: Red denotes power lines; yellow flags oil and gas; blue is for fresh water; green indicates sewage; purple highlights reclaimed H₂O; and orange tags communications or cable TV lines. Some acronyms, like MCI or SBC, are obvious; others aren't. IP, for example, means "iron pipe," and U.S.A. stands for "underground service alert" (the aforementioned area slated for excavation). As Mike Hart, a plumber for the San Francisco water department puts it, "I tell my kids that I'm a graffiti professional."²¹

Meanwhile, whether with logo or image, advertising tags most widely. This too has a history. In the tradition of architecture as display medium, especially before the rise of broadcast media, businesses painted advertisements on the sides of their



6.5 Hand-painted signage, Beaufort, South Carolina. Photo: Walker Evans, 1936 (Minneapolis Institute of Arts).

buildings (figure 6.5). In the nineteenth century, color lithography pushed posterizing into widespread public view, which led to restrictions on flyposting resembling those on graffiti. Then, in the twentieth century, electrification blurred distinctions between broadcast and architecture in new, and often inescapable ways. Today, electronic overlays accelerate and transform that process. Advertising tags locations, consumers, and transactions alike, and then aggregates and mines them. Advertising makes brands into places and places into brands. Even more so than with image, advertising operates in trademarks, logos, and

other point-specific, one-dimensional signifiers of brand. Moreover, it does so transgressively, like graffiti, ever advancing into places formerly free of its tags.

In his huge 2003 volume of street-level photography, Tokyo-phile editor Eric Sadin called it “Times of the Signs”:

Giant screens. . . Printed matter. . . Information facades. . . Interactive terminals. . . Screen arrangements. . . Flags . . . Billboards. . . T-shirts. . . On the tips of our toes (walking on characters). . . Global brands. . . URLs in the city. . . Mobile phones. . . Luxury brands and architecture. . . Video games. . . Signage. . . Neon signs. . . Pachinko. . . Print club. . . Karaoke. . . Sex stickers. . . Information [sandwich] men. . . Public phones . . . Media buildings. . . E-learning. . . Electronic billboards. . . Sound information. . . Surveillance. . . GPS. . . Internet cafés. . .²²

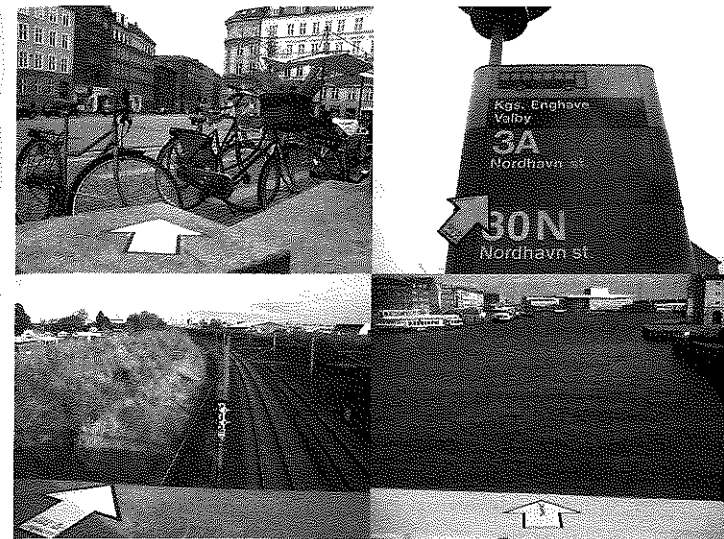
Cases in Adhesive Electronics

As a way to rethink handheld urban computing, location-based media, and their interplay with electrified architecture, you might start with simple pixel liberation. Not every square of light needs a frame. Anything that lights up and can be attached to some other surface potentially becomes a tagging system. If it also communicates, it can become part of a larger image. One serendipitous such device, which caught the imagination of artists and designers online, was the “LED throwie,” developed by Graffiti Research Lab in 2006. Each consisting of one or more LEDs (light-emitting diodes), a coin battery, and a rare-earth magnet, LED throwies, as their creators winked, were “an inexpensive way to add color to any ferromagnetic surface in your neighborhood.”²³

Adhesive art shows how location-based media don't always need GPS or Bluetooth to be known. It raises an important question about environmental awareness and the ambient. Can the purpose of handheld electronic media move beyond communicating for the sake of communicating, beyond tuning out so much of the world through personalizing everything, to helping someone be here now, in the sense of knowing an urban commons?

An especially well known project for such purposes was Yellow Arrow (2003–07; figure 6.6), recognized by the *New York Times* as one of the earliest instances of “the Internet overlaid” on the physical world “to make the city more browsable,”²⁴ and exhibited by New York’s Museum of Modern Art in 2008. The arrow itself took the form of a palm-size sticker. Each sticker had a unique alphanumeric code to use in text messaging to and from Yellow Arrow’s servers; you could buy one for 50 cents, stick it anywhere you dared (or had permission to, as the organization advised, to keep it legal), and upload a short text comment about that place. Passers-by who came across the sticker could then text the indicated code and read your comment or upload another of their own. Over the four-year run of the project, several thousand stickers were applied, mostly in a few pilot cities. Even though most arrows were one-offs (as is natural in such a bottom-up authorship format), some civic themes did emerge. In Copenhagen, the arrows were often used for political debate, for example about infrastructure issues, and in Boston, mainly to serve the cause of bicyclists’ rights.

In hindsight (Yellow Arrow closed for reasons of scale and funding), much of the project’s appeal came from the interaction aesthetic of physical tagging. Whereas the social networking



6.6 Yellow Arrow (2003–08), some instances in Copenhagen, tagging transit data. Photos: courtesy of Jesse Shapin.

aspect may have prevailed at the time because Yellow Arrow was seen as a community by some participants and as a way of life by a crazy few, more recent technologies and especially Twitter have taken that experience to new and different levels. Instead, the physical placement aspects of the project stand out. Here was social networking that was not ubiquitous, that involved the delight of discovery, that tested the cultural and material constraints of the city, and that tapped into the unofficial, uncriminal coolness of stickering. “It’s been called a game, a form of graffiti, and the largest performance art piece ever attempted,”

Many technologists are now working on a more viable development: “augmented reality” (AR). This expression has been around for at least twenty years, commercially viable products began to appear in the last five, and the prospects for explosive growth seem quite serious. The basic idea is certainly one of tagging. Different technologies determine how those tags overlay onto the visual field. The simplest way combines tagging with the use of orientation chips (GPS, compass, plus accelerometer) now included in smartphones. When introduced on the first Android devices in 2008, this combination led to a first wave of augmented reality platforms, such as Layar and Wikitude, which popularized the expression “reality browser,” and which began what soon became a flood of local apps. Unlike the use-anywhere apps that have proliferated over smartphone networks, these local apps tend to be use-someplace ones, and can therefore be even more numerous. Right now, this new medium is changing too quickly for a print publication to follow (just search “augmented reality apps” next time you need a guide in an unfamiliar town).

To achieve the spirit of frameless displays and palpable augmentation takes much better tracking and image registration that holding your smartphone up to a city scene can provide. The technology has been around in military and emergency response operations in the form of heads-up displays on windshields or eyeglasses. As of 2011, Google announced plans to introduce a fashionable consumer device in the form of wrap-around eyeshades. (Many a technofuturist believes the handheld smartphone is just a clumsy stage on the way to better wearables.) With respect to visual attention, heads-up and registration both mean not having to look away from the scene for the

annotation—no looking a few degrees downward at your smartphone, for example. Tracking means that the alignment follows your gaze quickly enough. This tends to reinforce a bias toward attention as selective visual gaze. If, on the other hand, the overlay becomes too immersive, as happened in many head-mounted goggles of the past, the disconnect between visual saturation and embodied systems of haptic orientation will quickly produce simulation sickness. This is not so simple as walking around with an iPod.

Local content for augmented reality overlays quickly followed themes from more conventional guidebook technologies: local restaurants, histories of local landmarks, and thematic walks to take. Architects took note of the prospect to overlay photographs of past and future conditions onto current views of the city. In 2011, MetaIO, a pioneering AR company, introduced a three-dimensional rendering technology for building urban augmented reality applications, such as for showing past or future buildings in context. Elsewhere, most of the early work has used Flickr images. Compared to other things to do with a smartphone, these seemed like ways to tune in rather than out.

With such prospects in mind, this inquiry next moves from positional tags to image overlays. To cover the world in electronic images may be neither possible nor desirable. To fill heads-up fashion eyewear with such images (at least where able to do so without causing sensory-motor disconnect) has the advantage that fewer messages might crowd physical space to be seen by everyone.

Location-based media in varying degrees of augmenting reality have grown from a curiosity to a big business. Geodata support enterprises in environment, infrastructure, logistics,

social services, security, and more. The geospatial web increasingly collects and delivers these managed data on demand, often to the very places they document. Embodied computation gathers and distributes these feeds in uncanny ways. Design conferences such as Lift and Where 2.0 feature the latest blogjects, mashups, and distributed narrative installations. Research societies focus on specific technologies such as positioning, sensing, embedding, displaying, and ad hoc networking, among many others; some even defend the electronic commons.

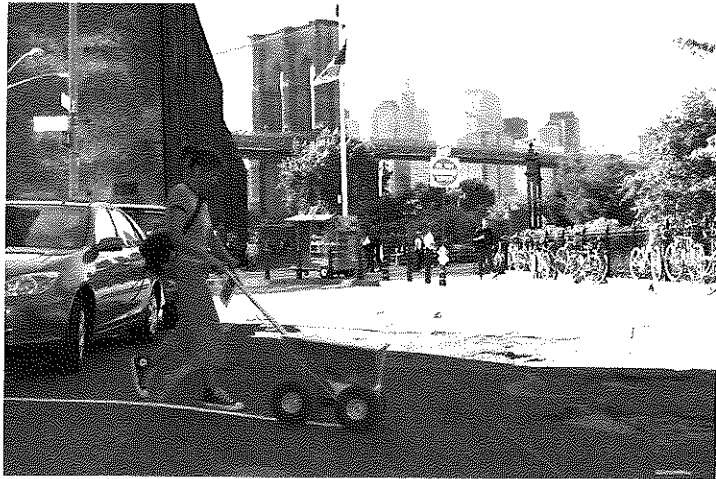
Many of these rapidly sharing domains share assumptions about ubiquity and mobility that raise deeper cultural concerns, chiefly about privacy and surveillance, but about many other things too. For instance, how does so much personalization recast citizenship or civility? What kinds of information best belong in one place and not everywhere? How might augmented reality media help document and conserve material and energy flows? Does ambient connectivity enhance or distract from environmental awareness and participation? The field of urban computing has emerged to explore these concerns.

Because the adoption rate of mobile handheld communication surpasses that of cars or television, it is rightly considered the most transformative urban infrastructure of the day. Mobile applications of the geospatial web—not always for positional wayfinding as geodata industries too quickly assume—thus tend to dominate artistic and academic investigations. Agendas in social navigation and environmental management also emerge. A bottom-up surveillance (*sousveillance*) campaign may flag locations where surveillance cameras are active. More ambitious *sousveillance* may try to reverse corporate greenwashing by exposing cultural offenses.

Tagging thus crosses from personal territorial marking into electronic art and technological design. When a large new field grows up around a given focus, some of its smaller, less dominant aspects may help shed light on its new outlooks. For example, to question ubiquity, it helps to study the situated.²⁹ To question mobility, it helps to study fixity, to look at, say, the expressive urban material constraints that rude young aerosol tagging ignores. And thus also, to question the spellbinding high-tech complexity of handheld social networking, it helps to consider low-tech and sometimes antisocial tagging.

Awareness of a Commons

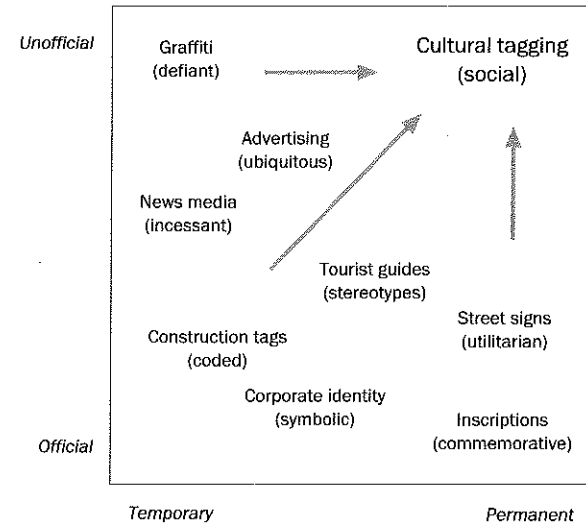
In the literature of the commons, there exists a well-known trope on tagging, “the ‘I’ and the ‘it,’” first advanced by urban sociologist Richard Sennett in his 1990 book, *The Conscience of the Eye*. Does a youngster spray painting a subway car in the Bronx see that subway car? Sennett recalled New York in the 1970s: “The scale of this graffiti was what made the first impression: there was so much of it. . . . The kids were indifferent, however, to the general public, playing to themselves, ignoring the presence of other people using or enclosed in their space. . . . Transgression and indifference to others appeared joined in these simple smears of self, and with a simple result. The graffiti were treated from the first as a crime.”³⁰ Whereas a tagger just shouts “I,” the “it” expresses the presence of others, past, present, and future through the material forms and constraints of the city. There are limits to personalization. Working with external circumstances that result from the presence of others pushes you to a higher level, and that is an important aspect of urbanism. The aggregate of these material expressions constrains



6.7 Public service: line chalking as tagging. Eve Mosher, HighWaterLine, 2007. Photo: Hose Cedeno.

each individual contribution. To Sennett, whose more recent work on craft affirms this outlook, an artist working in a civic capacity does indeed see this material commons and lets it shape his or her intentions and expressions, through which the city becomes a medium.

To sense a cultural accumulation can be the first step toward recognizing a commons. The mature tagger can see the city as the cumulative state of many people presenting themselves to one another. Acts of tagging can add to the understanding of the city as commons, rather than detract from it. For example, in an early instance of public awareness graffiti and ambient ecofeedback, Eve Mosher's HighWaterLine (2007; figure 6.7) chalked



6.8 Toward a new epigraphy.

the 10-feet-above-sea-level contour through the most densely built parts of New York. No degree of augmented reality tagging has quite the impact of old-fashioned chalking.

Ideas of the commons often resurface in this inquiry. We must return to them with respect to networked urban resources, with respect to environmental history of information, and with respect to attention itself. They raise fundamental questions about civility, the distracted urban citizen, and the public good.

Between the age-old extremes of transgressive graffiti and official proclamations, urban markup forms a new middle ground (figure 6.8). More persistent, interlinked, and filterable than graffiti, but more improvisatory, narrowly themed, and

socially engaging than official signage, the tags now appearing in location-based media invite consideration as a genre in themselves. Do they invite a new epigraphy? What does electronic tagging do for the upkeep and valuation of physical commons?

6. TAGGING THE COMMONS

Main idea:	New cultural middle ground, between official inscriptions and transgressive graffiti
Counterargument:	Semiotics has been there, done that
Key terms:	Tagging, epigraphy
What has changed:	Tags can be filtered and linked
Catalyst:	Rise of location-based media
Related field:	Environmental graphics/wayshowing
Open debate:	Will anyone curate urban tags?

Frames and Facades

7

Everyone knows where attention goes: to all those glowing rectangles. So where a general history of information might explore how digital displays have superseded print, an environmental history of information explores how they have proliferated in physical space, as when screens cover whole building facades. Digital displays now number in the billions. According to Displaybank, already nearly half a billion large-area TFT LCD (thin-film transistor liquid crystal display) panels ship from east Asia in a single year, as do more than a billion small-format LED panels for cameras and smartphones.¹ Then, besides the billion or more smartphones being carried around, billions of other displays are being built into everyday life: at points of sale, outside meeting rooms, on parking meters; as electronic paper, data murals, electronic billboards, huge media facades. At a baseball park, the crowd watches the larger-than-life close-ups of itself on the JumboTron, more than it watches the game. At street level, a hyperlocal events site such as EveryBlock takes



7.1 Bulletin boards at street level: *Boston Globe* war map, 1944 (Getty Images).

photo sharing from the web to the sidewalk, supplanting the now obsolete newspaper and recalling the town bulletin boards of former times, which existed well into the twentieth century (figure 7.1).

Picture a car pulling in for some gas. Both the car and the gas pump have a video screen, where ten years ago they did not. The kids in the backseat have screens of their own, as if the world going by is no longer worth watching. A kiosk inside the express mart has several touch screens for the sole purpose of selling lottery tickets. This frees the attendant to watch a bank of security monitors instead. A television, placed up high atop the coolers next to the Buddha figurine (as if both sentimental

totems of past cultural tradition), is always on though seldom watched.² The widescreen display above the snack rack gets more attention: larger, more visible from the entrance, and programmed with much higher production values, it presents a constant stream of mostly close-up, slow zoom-in shots of food.

Today fewer screens require you to sit down or to fix your gaze for more than a moment; fewer fill your field of view. Multiple screens may compete for your attention, or they may recede into a background of possibilities for shifting attention. The contents of their fragmented displays change across a greater range of time periods and in response to a greater range of circumstances than was possible before. Not all displays describe someplace else; sensing, networking, and embedded computing increase the capacity for displayed images to be about current conditions in their immediate surroundings.

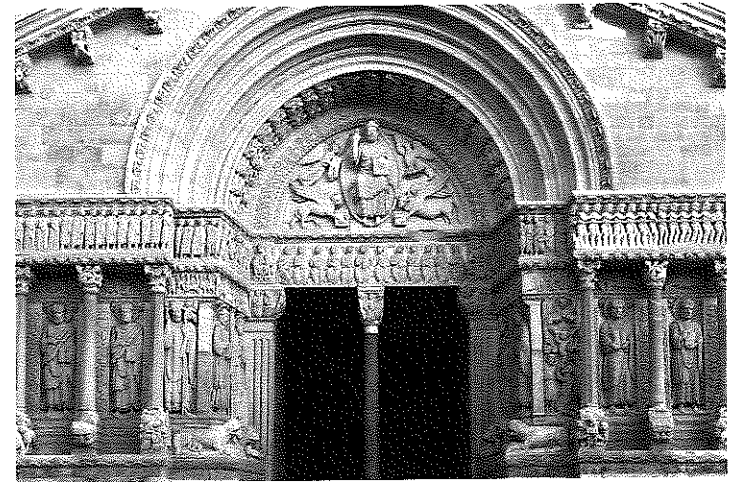
The ambient emerges from this visual abundance. In this it has reached a new stage. Vision famously fragmented in the twentieth century, from cubist painting at its start to clickable windows by its end, yet it mostly kept its frame. Indeed, you could identify that century as the one where people sat down passively in front of framed, flickering screens. Now, as display technology diversifies in size, role, and use, visual culture is accelerating and transforming once again. The more that images diversify, proliferate, and compete, the less any one of them may succeed at capturing your attention. Instead, they all fuse into a landscape, in which the perspective furnished by any one frame yields to a new kind of perspective on a world full of them. These new display practices erode assumptions about the cinematic nature of the frame, and instead belong to the world of architecture.

The Facade Communicates

This inquiry into the history of information began from ancient inscriptions, many of those on buildings. In a way, buildings were the first mass communication medium. Icons in architecture served to teach an illiterate laity (figure 7.2). In much the same way, textual inscriptions in architecture served to instruct a literate public. These weren't just tags: although many acted as titles, narratives, schedules, rolls, and proclamations, they also had intrinsic spatial attributes in the design, layout, and placement of their characters. This was especially so in cultures whose prohibitions on figurative art led to expressive outlets in calligraphy, which itself had spatial attributes. Many of these communicative elements were intrinsic to facades. Picture a ruler speaking to the populace from the portico of a palace. In Istanbul, the High Gate of the Topkapi Palace, from which the Ottoman sultans and their delegates spoke, became synonymous with their imperial power; both became simply known as the *Porte*.

The words *edify* and *edifice* relate. Murals, illustrative ornament, and form itself all made architecture communicate. Between the persistence of its artifacts and the relative lack of other media, architecture imposed ideas with a power that would now be difficult to imagine. Too few histories of information acknowledge this architectural power; too few histories of information are environmental.

Even a history of writing can become a history of certain spatial dispositions.³ Buildings instructed not only directly with text and images, but also indirectly through the devotion implied in their workmanship and their permanent embodiment of messages. The extensive embellishments of a French medieval church would have meant less if fabricated with machines rather



7.2 Facade that instructs: portal to medieval Church of Saint Trophime, Arles (twelfth century). Photo: Steffen Heilfort/Wikimedia Commons.

than by hand. Thus, in many stages of a building's history, distinctions between text, images, and ornament can seem to all but disappear.

How buildings have been transformed but never made obsolete by successions of modern media, whether print, broadcast, or digital, remains a perennial theme in architectural history and theory. Now, as displays ranging from tiny touch screens to huge media facades provoke new kinds of controversy, many more disciplines beyond architecture have come to appreciate those histories.

Architectural form can, of course, communicate without any inscription. Thus a tripartite arch can stand for a particular military victory. Thus, too, the massive, imposing facade of a building suggests permanence, and the spire of a church, ascendance. The great stupa of Borobudur, ornamented with some 1,400 carved stone relief panels of scenes from the Sudhana, symbolizes the journey within, to be acted out by ascending its spiral pathway. Through form and not just annotation, architecture represents organizations to their constituencies. In the process, it also tends to represent the cultural circumstances from which it arises.

Furthermore as postmodern critics took such delight in reciting, formal signifiers have developed a visual code of their own, sometimes independently of their referents. The meaning of a sign comes as much from the circumstances of its creation or its reading as from what it refers to. In the free play of signifiers that results, the forest of signs becomes a delight in itself.

No wonder most buildings simply serve as carriers of overt, literal signage. This was true even before modern billboard technology and electric lighting. The brick side walls of many nineteenth-century buildings were covered with hand-painted signs. Although you can see relatively little evidence of signage in surviving portrayals of urban scenes before modern, literate times, such as Italian Renaissance paintings, other emblems of trades, perhaps considered inappropriate to include in precious paintings, appear in the engravings of William Hogarth and other artists of the eighteenth century. A major obstacle to compiling a complete environmental history of information is how little of everyday streetscapes survives either in images or in print.

Glowing Forms

One chapter in a longer such history could dwell on the introduction and impact of electricity. With electrification, walls were not only written on, but lit up as well. Fire, the medium of ancient signal technologies, has long been used to embellish or illuminate cities, at least in part. But the light it cast didn't become integral to the urban scene until the advent of its much safer, brighter, more evenly distributed successor, incandescent lighting.

Famously, at Chicago's World Columbian Exposition of 1893, when direct memories of the Great Chicago Fire of 1871 were still quite fresh, the nighttime illuminations drew the largest crowds. Not only was lighting no longer coupled with the threat of conflagration, but it was now also fast, relatively cool, and unprecedentedly controllable.⁴

In the Jazz Age heyday that followed the spread of electrification, urban nighttime imagery became a distinguishing cultural phenomenon. Many American cities touted their own versions of New York's luminous Great White Way. At street level, the signature medium became neon. Amid the financial speculative boom and bust of the New York 1920s, one of the more easily traced historical threads is the rise and fall of the Claude Neon Company, whose stock took a path that today would look familiar to investors in many a 1990s dotcom. The crackle and glow of the neon tubes were attractors in themselves. The medium's lurid quality fit with the anomie of the age. As a harbinger of the ambient, it communicated without need for message. "What, in the end, makes advertising so superior to criticism?" Walter Benjamin famously quipped, "Not what the moving red neon sign says, but the fiery pool reflecting it in the asphalt."⁵

Architectural landmarks, which had always anchored mental images of the city, now appeared in what was literally a new light. Lithographic prints that were posted on so many walls could now be highlighted for emphasis and for visibility from greater distances. Thus the billboard industry took new form. New kinds of signs and facades integrated light in ways not possible with flames. Buildings became beacons (figure 7.3), and skylines became more sharply defined by night than by day. Some of these beacons displayed weather data, like those of Pittsburgh's Gulf Tower, for example: red if warming, blue if cooling, steady if clear, blinking if snow or rain.⁶

Later, backlit corporate logos assumed such prominence that nighttime skylines came to resemble groves of sign pylons. In some commercial landscapes, each of the seemingly pixilated features was itself a branded backlit sign. In the 1990s, star science fiction novelist Neal Stephenson named this phenomenon "loglo." "The loglo . . . is a body of electric light made of innumerable cells. . . . Despite their efforts to stand out, they are all smeared together, especially at one hundred and twenty kilometers per hour."⁷

Glow stands out best against a large dark landscape. Starting in 1936, Las Vegas pumped cheap hydroelectric power from Hoover Dam into a new kind of illumination spectacle amid the nighttime darkness of the Mojave Desert, a spectacle that eventually became America's largest tourist destination. The 1995 opening of the Fremont Street Experience pioneered the use of lights as pixels in large outdoor display surfaces, in this case, over the downtown neon belt already long known as "glitter gulch." Alas, this didn't endure long enough to earn historic preservation status. In 2004, a 12.5-mega-pixel LED array replaced the original incandescent grid.⁸

Today, many cities have designated signage districts, where advertisers are free to turn up the volume.⁹ Especially in the boom of urbanizing China, the greater the range of things emitting light in your field of view, the more uncanny the visual effect. Amid the anomic of a Hong Kong frontage road, electronic billboards take root. For a period in 2009, a four-story full-motion image of talking lips played in one such frame.

Not only in signage districts but also through everyday design neglect in office towers and parking lots, so much light gets spilled that many cities now recognize and regulate light pollution. Some neighborhoods even restrict the use of the lowly boxed backlit sign.¹⁰ This is a topic worth taking up later, as an instance of governing the ambient. But, for now, consider one extreme genre of digital display: the electronic billboard.

Little seems ambient about a fifty-foot LED image. Few electronic billboards go up for civic reasons. Few invite the kinds of imperceptibly slow patterning that could make so prominent a surface pleasant to live with. Instead, today's electronic billboards rival texting while driving as exemplars of dangerous distraction. Studies indicate sharply greater safety risks when a driver's gaze goes off the road for more than two seconds. As a matter of policy, many cities have banned full-motion billboards. Many have compromised by allowing electronic billboards that only flip fixed images. Thus California requires four seconds between frames, and many states require eight. Yet each such change creates a visual event that can be seen from a distance of ten miles or more.¹¹

São Paulo, a city seldom cited for its visual harmony, banned billboards outright in 2007, at least in particular zones that became the direct opposite of signage districts. Between 2007



7.3 Building as beacon: Metropolitan Life tower, New York City, 1905. Photo: Jessie Tarbox Beals (Schlesinger Library, Harvard).



7.4 Noteworthy recent large-scale media facade: King's Road Tower, Jeddah, Saudi Arabia (CITILED). Photo: courtesy of Alberto Ramon, CITILED.

and 2009, nearly 20,000 billboards were taken down. The global advertising industry responded with alarm at this threat. The ban, though under reconsideration, was still holding as of 2012.

Los Angeles, the capital of cinema, surely loves a lit screen. Although famous for hilltop views of its grid of glowing avenues receding to the horizon, the city emits far fewer lumens per capita than Las Vegas and has, as yet, no signage districts on a par with Tokyo's. Nevertheless, having served as inspiration and site for that infamously prescient work of glowing dystopia, *Blade Runner* (1982), Los Angeles is now a poster child for billboard regulation. As thousands of billboards convert from printed vinyl to LED arrays, neighborhood associations and city council members have taken exception. In 2009, the city called a moratorium on new billboards. KCET, a local viewer-supported television station ran an exposé, "Billboard Confidential," that identified Los Angeles as the "illegal billboard capital of the world," and that explained the process by which advertisers silenced politicians by providing copious free advertising.¹² By the time slowly enforced regulations required the owners to remove a billboard, they had restarted the process in another part of town.

Media Facades

What happens when huge electronic displays become a persistent part of physical architecture? Jakarta has claimed what as of 2009 was the tallest façade to be programmably illuminated, for the Grand Indonesia Tower at fifty-seven stories; as well as the longest (as of 2012) LED screen yet realized, in the Taman Angrek mall at over eleven hundred feet.¹³ As of 2012, the tallest realized full LED display in the Middle East was on the King's

Road Tower in Jeddah, Saudi Arabia, at twenty-six stories high (figure 7.4), and imaginatively programmed with a variety of artistic, civic and commercial images.¹⁴ From projects such as these, it seems clear that media facades, the big attention seekers of the electronic world, belong to an architecture for the age of YouTube. Instead of designing for still photographs in glossy magazines, the owners and architects of the twenty-first-century design for one-minute video clips going viral on the Internet.

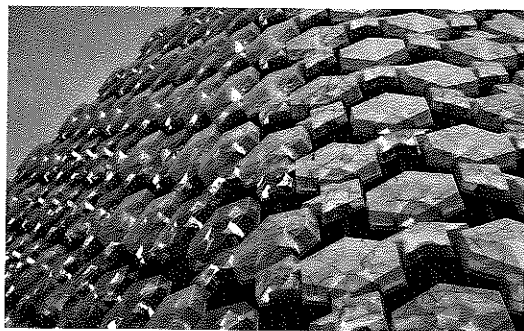
Media facades became especially noteworthy around the time of the 2008 Beijing Olympics, whose features included the glowing Voronoi tessellation of the natatorium, and the LED proof of concept GreenPix Zero Energy Wall (figure 7.5a). LEDs integrate well with tiled skins such as the recently completed Iluma building in Singapore (figure 7.5b), which combines display with a breathable mesh of polycarbonate polygons, overlaid outside a conventional structural facade. This escapes the rectangular frame. The media facade artists of realities:united explained how they emphasize that any particular building is "not a monitor" (not that one anyway).¹⁵

Media facade technologies have certainly been advancing, most notably in transparency, which besides letting the inhabitants see out, also allows the form of the facade and its screens to remain visible when the display is turned off (or it eventually wears out). In the years just before 2010, the first widely used technology for transparent media facades was MediaMesh, which originated in Germany.¹⁶ Integrating rows of LEDs into latticed metal tubes mounted like a sunshade over the structure of a facade (figure 7.5c), MediaMesh is a screen in the older architectural sense of that word, and not the prevailing cinematic or digital norm. Taking the form of a lattice rather than a panel,

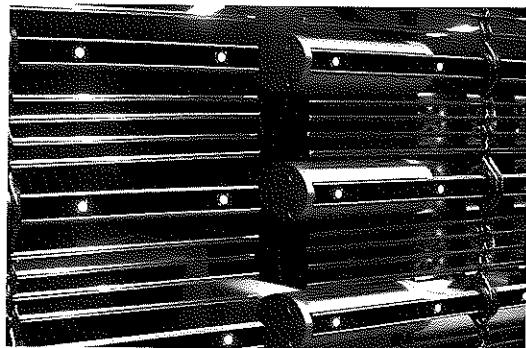
7.5 Media façade surfaces.



(a) GreenPix Zero Energy Wall, Beijing, Simone Giostra & Partners, 2008. Photo: courtesy of Simone Giostra.



(b) Crystal Mesh façade, Iluma center, Singapore, realities:united, 2009. Photo: courtesy of Jan Edler.

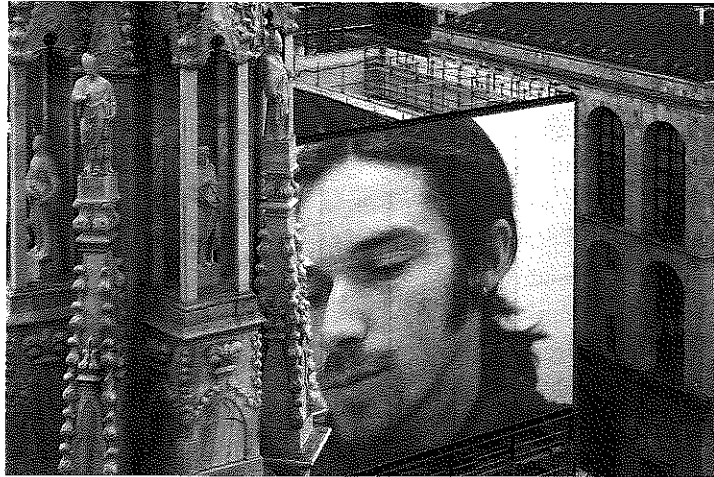


(c) MediaMesh technology, up close. Photo: courtesy of AG4.

it combines material and computational elements in a refreshingly simple way. In perhaps its most widely known early application, in Milan, for the 2007 renovations of the Arengario Museum on the Piazza del Duomo, MediaMesh encased the scaffolding that regularly surrounds European cultural monuments during maintenance (figure 7.6), displaying supersized images of supermodels from the world of fashion advertising. The Milan installation thus drew a clear contrast between architectural embellishment and framed display.

Scale in space affects how an image reads: it reads differently on a huge scale, a personal scale, or a tiny, postage-stamp scale. An image that is larger than your body, and perhaps too large to see whole, reads differently than one you can hold in your hand. Huge scale makes close-up images uncanny: the smaller the object and closer the shot, the stranger the effect when displayed very large. The effect draws focus onto the object instead of its scene, and further reduces your awareness of the frame. Thus, instead of suspension of disbelief, which sitting before a framed perspective always involves, the effect is “out of scene,” or disorienting.

Scale in time also affects how an image reads. A transitory image reads differently than an enduring one. An image that changes continuously with a natural cycle, like the shadows crossing a facade over the course of an afternoon, reads differently than one that imposes its own orchestrations of time and transitional effects. The ambient display, no longer constrained by the short time frames of broadcast, need not jump around like television programming, and could, for instance, operate on a weeklong, barely perceptible visual cycle. Building facades have the opportunity to do things over days, weeks, and years that



7.6 An early MediaMesh installation, Milan, 2007 (AG4 + GKD).
Photo: courtesy of GKD.

YouTube clips, television ads, and drive-by electronic billboards cannot.

So despite the huge range of controversy surrounding media facades, the main argument seems simple enough. Media facades should behave differently than cinematic frames, and over longer time cycles than most video productions. They may sometimes work best without pictorial images. Because almost any new technology is used to do the same old things at first, the owners of media facades mostly treat them like billboards, museum banners, or video screens, in other words as frames for other genres of visual communication, and (so far) too seldom as genuine extensions of architecture.

Window, Screen, Frame, Facade

An inquiry into attention and an environmental history of information share a common interest in apertures. A frame sets its contents apart from their surroundings, to be viewed through an opening in some different way, often in some different perspective, as if through a lens; from one space to another, as if through a window; and perhaps with some filtration of light, as if through a screen. Consider these openings as attention devices in architecture.

In architecture, a simple, well-placed opening frames a view, regulates the flow of sound, light, and air, and dramatizes passage from one space to another. As Le Corbusier famously pointed out, the window is one of the best themes by which to approach the history of architecture.¹⁷ The most compelling windows connect contrasting worlds: an office and garden, an operations booth and factory floor, a prison inmate and visiting spouse, a warm bedroom and a winter storm. Thus an English window seat provides a way to be both indoors and outdoors in rare fair weather in a climate that discourages the building of patios and loggias. Where the spaces on two sides of an opening differ in appearance, conduct, privilege, ownership, or atmosphere, the physical portal remains the most vivid framed threshold of all. By contrast, there is little so regrettable about modern building as the loss of windows that open.

The screen means something different, and often more active, than the frame. A screen (often in the form of shutters or blinds) can be quietly gratifying to reconfigure on demand, and across daily and seasonal cycles. Classical Chinese architecture made remarkably effective use of open lattice screens, for example. Today a smart green building skin adaptively responds to

changes in the weather. Of course, a facade might also serve as a video display device, a screen in the more usual sense of the word. Imagine the word *screen* as a verb: in more general use, to screen can be to showcase, to shield, to filter, or to hide.¹⁸ In building, to screen usually means to mask or filter sun, wind, or just the views occupants have of one another.

A facade fills a view, enduringly, often inescapably, in embodied space. Like a face, it can express, edify, impose, or mask. In some uses, *facade* implies a false appearance to hide behind. Because a facade may bear inscriptions, whether in stone, calligraphy, fresco, flyposting, neon, or LED meshes, its full extent also becomes a frame. Traditionally, architectural composition emphasized both the facade and openings. This made the facade a two-way viewing device.

Today when the word *window* more usually means a frame for a task that appears on a screen, it is worth taking note of these related constructs of openings. Whether in architecture, graphical user interfaces, photography, cinema, or their combinations, the aperture has many vital stages in the history of information. For centuries, the architectural contexts of these apertures dominated visual culture. Then came the ascent of codex books, camera exposures, and cinematic screening as frames. For the last century, cinematic screening has dominated: the viewer is still, the frame is generally undivided, the screen lights up, and the image is seen through its moves. But now, as new display technologies flood the world, a new visual era has arrived. Metaphorically, the frame has shattered into so many fragments, each of which is itself a visual instrument. Painters have long understood how to manipulate such multiplicity of projected vision, of course. Nearly a century before stacks of

virtual desktop windows, or the layering of the city with glowing rectangles, the cubists vividly fragmented space.

One core belief in media studies is that when a frame fixes a perspective, it also fixes a cultural position. The frame represents conventions of suspending disbelief. To question the frame is to expose those conventions. Postmodern scholarship learned to go beyond the visual genre to which the frame belonged, for example, into the politics or literature that influenced the frame's visual production. In today's information technology, such cross-readings and metacontexts accumulate nearby or may be summoned instantaneously. Although in any age a master such as Velázquez or Vertov could question the frame from within, digital media have generally made it easier, indeed normal, to do so from outside, in close proximity, by quick juxtapositions of ubiquitous media.

Among recent works of visual culture theory, none has looked quite so literally at the frame itself, nor so thoroughly at the frame's relations to windows and screens, as Anne Friedberg's rich history, *The Virtual Window* (2006).¹⁹ Beginning with Renaissance architect Leon Battista Alberti's oft-cited metaphor of the window as perspectival aperture ("I draw a rectangle of whatever size I want, which I regard as an open window through which the subject to be painted is seen")²⁰ and closing on the multiple apertures of Microsoft Windows, Friedberg found an "age of windows" in which sitting before the frame's fixed perspective became normal, and for which cinema bore out "in retrospect, the remarkable historical dominance of the single-image, single-frame paradigm as in intransigent visual practice."²¹

The frame, whose general use arose concurrently with the use of easels, optics, and perspectival projections, comes to

represent all such artifice. “The exact origins of the picture frame are somewhat indistinct, but the frame became a component element of the painting when the painting became independent from the wall,” Friedberg observed.²² A frame creates an interpretive context by setting its contents aside from their surroundings. This tends to privilege the contained, more like a treasure box than a window. A frame is an object that makes its contents an object. “The frame suggests a common position for viewing: separate from but facing it.”²³

Next comes the insight to juxtapose two separate images that invoke the same feeling, through montage, associative recall, hypermedia, framelessness; this is the core of media studies. In his influential *Language of New Media* (2002), Lev Manovich asserted the essential construct of digital media to be the composite²⁴—rather than simply serving as a transparent frame, digital media now layer, substitute, and recompose.

Historical perspective on the multiperspectival paradigm is “postcinematic,” an expression for which Friedberg could well be credited. The cultural distance necessary for such perspectives has quickly grown with the proliferation of virtual windows—first on the desktop graphical user interface, then with the handheld and situated gadgets of pervasive computing, now at larger-than-life scales to integrate with the built environment, and using amorphous display techniques sometimes without screens at all.

New Surfaces, Amorphous Displays

Thus the looking glass has shattered, with each of its shards becoming an instrument in itself. Each now assumes unique features and reflects specific tastes; together, the shards are

experienced in a montage that is again situated in built space. Today, the proliferation of virtual windows not only moves beyond the desktop, but also beyond the static frame. Advances in display technology diversify the contexts and formats in which visual information may appear. Beside architecture appearing in projected movies, movies (and other projections) appear displayed onto architecture, as in the works of eminent artists such as Rafael Lozano-Hemmer. For more casual purposes a projector can fit in your pocket and display onto any nearby surface, such as a colleague’s shirt. Sometimes fabrics themselves serve as display devices; by means of conductive thread, eTextiles already exist.

So far, the proliferation of display possibilities has run on flat screen technologies, especially liquid crystal display (LCD) technology, which are still fairly expensive and largely confined to rectangles. It wasn’t really possible with the cathode ray tube (CRT) screen, which took up too much space and filled most of a desk or table top; it couldn’t be hung on a wall, much less in a smaller spot like a seat back in an airplane or car. The cultural appeal of the flat screen has become so powerful that you can’t give CRT screens away—many reuse centers or charity dropoff points simply refuse to take them. Thus considerable anticipation surrounds the next stage of succession, from backlit rectangular panels to new forms of display.

Electronic inks don’t glow, are visible at wider angles, and don’t have to be refreshed as often as backlit LCDs, which makes them much better suited for sustained reading of still text and for reading in reflected natural light. Early e-readers such as Kindle® were among the pioneers at bringing electronic inks to mass markets.²⁵ It has helped that e-inks consume power only to

change, not to maintain, an image. Their slow refresh rate makes electronic ink displays inappropriate for rapid smooth actions, like moving a cursor or playing a video or video game, which has helped distinguish e-ink devices from more general graphical user interfaces (GUIs). Readers of literature gain peace of mind knowing that a flash clip won't jump out at them when they turn the page.

Reflective displays eliminate backlighting and yet support rapid motion. Advances in LCD technologies such as ChLCD (cholesteric LCD) display, introduced by such companies as Kent and Magink, work on scales large enough for billboards. And because reflective LCDs don't emit light, reflective LCD electronic billboards are less obtrusive. Reflective LCD display technology also works for indoor applications of arbitrary size, by means of a system of stackable 7-inch tiles. By using reflected light, wall-scaled graphics also become less obtrusive.²⁶ This works well on the intermediate scale of kiosks and exhibit design. It allows video (which so many people seem to want) to play without luminance, which annoys neighbors. In another variant, combining LCD and LED technologies, Transflective™ displays use either reflected or emitted light depending on conditions.²⁷ This provides power savings by day, when backlit display isn't necessary. It may also work well for e-books.

Relative to conventional backlit LCD, these new technologies consume less power. Thus, besides having less obtrusive display, they also have less obtrusive housings. In some cases, power consumption is low enough to run wirelessly, on small batteries or solar cells. Power is saved by replacing hungrier, earlier technologies, such as neon. In this, the most widespread opportunity is to replace incandescent city lights, such as the ubiquitous

yellow of sodium fixtures, with energy-conserving LED systems. Much like the replacement of gas-burning lamps with incandescent lighting a century ago, this transition not only reduces waste but also introduces new kinds of programmable control. When combined with lighter housings and wireless power, this lets an LCD/LED display go just about anywhere.

MIT Media Lab called it "pixel liberation."²⁸ Whereas reflective displays escape unwanted glowing, liberated pixels escape ubiquitous rectangles. This provides prospects more in abstract data display than in conventional pictorial imaging. As William Mitchell observed in 2006, "[LED technology] breaks down the traditional distinction between computer displays and lighting systems, and provides a new and very inexpensive way of visually defining and unifying urban public spaces."²⁹

In a step toward participation, many new surface technologies allow for touch. Large-scale multitouch screens let whole groups engage in visual display much as the far smaller touch screens of smartphones do individuals. The Helsinki City Wall project (2008), one of the first to apply multitouch in a sidewalk setting (figure 7.7) served as a conversational site.³⁰ The technology more often appears indoors and horizontally, as on exhibit tables in museums.

Multitouch floors provide the more bodily-orienting sense of engagement that comes from walking on something. As far back as the 1960s, interface pioneers such as Myron Krueger recognized this condition. Early twenty-first-century prototypes from the dawning tangible media age applied iFloor technology to information access, such as in the Alexandra Institute's 2004 project for the public library in Aarhus, Denmark.³¹



7.7 Early public multitouch surface: *City Wall*, Helsinki, Helsinki Institute for Information Technology, 2007. Photo: courtesy of Giulio Jacucci.

Although windows have been the emphasis here, note that floors and ceilings also played much richer roles in architecture before print and electronic communication. Changes of material and texture in floors communicated zones and protocols, and the design and decoration of ceilings conveyed aspirations. It is a fundamental act of orientation to look up to something. Many

cultures have built this into their architecture. And it is a an impoverished culture, or at least a sign of poor architecture, where people walk around without without looking up.³²

Embodied orientation to a surface can affect how you read and make sense of that surface. Whether an image, text, abstract data display, ornament, or just well-composed building skin, an architectural surface isn't just visual. Furthermore, the perceptions and mental constructs that result from better-balanced sensory experience produce different, and possibly richer, spatial mental models of the sites of experience.³³

Thus it seems fair, and perhaps quite culturally significant, to value urban landscapes of information more, and the particular images applied to buildings less. Advertising supergraphics are leading the wrong way culturally. Still photos of empty buildings for glossy magazines do no better. And, of course, the notion that ornament, signage, or data systems are outside the scope of architecture now seems quite dated. Instead, the question becomes how all these visual systems aggregate.

Visual Overload Reconsidered

You might want new ways to look at this media-laden world. As the technological means for delivering superabundant stimuli keep expanding, so too must the attention skills for dealing with them.

Vision always filters; human powers of visual selection prove quite remarkable. Yet it is commonly recognized that involuntary responses exist, especially to quick movements of bright objects in the periphery. Although in the natural settings where vision evolved, those might be infrequently encountered predators or prey; instead today they are incessant, cognitively engineered, attention-seeking, artificial annoyances.

Filtering depends on more than vision. Seeing is, of course, culturally conditioned. But today that conditioning has become much more technologically mediated, for example by explosive growth in the sharing of photos, or in the perpetual use of social media as a means of filtering.

Nevertheless, filtering has its limits. You can screen out ultraviolet wavelengths with a good pair of sunglasses, but there is nothing you can wear, short of a blindfold, to screen out an electronic billboard. You can get up and walk away from a desktop computer, or put your smartphone away in your bag, but sometimes there is no way to escape an information landscape.

Thus the ambient requires some governance. As inhabitable image formats diversify, so do the occasions and ways of reading them. Much as the twentieth century amplified the ability to deliver active images within a frame, so the twenty-first is well on its way toward creating landscapes of visual production, full of communications for someone else. In these, the process of filtering has increasingly been left to the viewer. For the web, social production advocate Clay Shirky has called this “publish first, filter later.”³⁴ But while the online world of hypertext has well-developed tools for filtering by those who think to apply them, the physical world of tagged and screen-laden cities does not.

Physical embodiment also invites foraging. Distinct from searching, where you know specifically what you are after, browsing, where you are open to whatever might appear interesting, foraging moves among clusters of stimuli. Like a bear in a mountain meadow, who moves on to the next berry patch before finishing the present one, and indeed as soon as another looks interesting, foraging in information media runs less on optimization (the best berry patch) or efficiency (getting every berry)

than on perceptions of sufficiency (plenty right here—or there). Distribution in physical space brings embodiment into this kind of attention. Foraging the city involves spatial navigation, rights of access, and interpersonal social distances. It also involves formulas of visual cues matched to target populations; modern marketing combines spatial sorting with cultural filtering. Consumers avoid overload by confining themselves to familiar “brandsapes.”³⁵ Nevertheless the least predictable zones of the city are often the most interesting ones. Besides even in the most formulaic settings, advertisers cannot assume that anyone is looking.

Thus, as a way to imagine the degree of change wrought by the ascent of filtering, consider the oxymoron “unnoticed spectacle.” Much of mid-twentieth-century critical theory assumed that, with radio and especially television being run by just a few centralized networks, most people would notice a single dominant feed and that “spectacle” would reflect how much of that feed was engineered as distraction, presumably for political purposes. As voiced best by Guy Debord, spectacle not only commanded view but also furnished the terms of viewing: by providing the times, places, language, talking points, and subject matter for public attention, it was the perfect frame.

Today, so much has been made into spectacle that little of it amazes. So many channels exist that every group of viewers has one just to its liking. So many visual media exist that no single medium, not even television, nor electronic billboards, can claim command of its viewers. Recording, fast-forwarding, sharing, linking, exposing, rating, bombing, sousveillance, and so many other actions of many-to-many communication reduce the chances for any one feed to be noticed. Although many people

remain passive captives of media monocultures, none of the former one-to-many channel owners can so confidently claim, as their twentieth-century counterparts did, that “we” think this particular way or that. Even the most watched event of the year, whatever that may be for a particular subculture, is watched alongside several others, intermittently. The contents of each frame, engineered ever more crassly to capture attention, nevertheless fail to capture attention, which instead drifts and marvels at how, wherever you look, so many frames blink and glow.

With so many new relations among windows, screens, frames, and facades now filling everyday space, watching has become less important, and foraging has become more so. Having more options improves the chances that you will find enough interest somewhere. Often you can discover that without the concentrated effort of dedicated search. You work at a lower level of detail, and a higher sense of drift. If there seems to be enough here, you might be open to more of it, and scan it more closely, or with more particular intent. You take cues from surroundings about what to be looking for. Context and sensibility intertwine.

The ambient is such a relationship. The return of inscriptions to building scale recalls a time before framed apertures. To inhabit a patchwork continuum of glowing surfaces is to look less at any one. To move among so many screens as an environment in itself is to stop less often before any one of them. To enjoy their multiplicity as an embellishment of their place is to look less through any one of them as if a threshold to somewhere else. In the words of Stephenson: “Despite their efforts to stand out, they are all smeared together.”

7. FRAMES AND FACADES

Main idea: Explosive growth in number, formats, and contexts of situated images

Counterargument: Corporate media and spectacle

Key terms: Frame, glow, amorphous, postcinematic

What has changed: People move around with and among displays

Catalyst: Many new display technologies

Related field: Visual culture theory

Open debate: Shared visual experience?

For the technology of atmosphere, and with respect to attention, the idea of cooperative buildings raises two important questions. Does the psychological comfort of having a stake in environmental management offset the physiological discomfort that may result from a tendency to overcompensate or from how no atmospheric state pleases everyone? And does participation in environment provide some grounding or calming, and thus a balance in kinds of attention, or does it become just one more annoyance adding to a sense of overload?

8. ARCHITECTURAL ATMOSPHERES

Main idea: Ambient is not uniform; atmosphere is design subject matter.

Counterargument: Air should go unnoticed

Key terms: Atmosphere, conditioned by air

What has changed: Smarter, greener building

Catalyst: Environmental awareness

Related field: Architecture

Open debate: Do inhabitants want to participate?

Megacity Resources

9

Urban computing now comes of age. Beyond the responsive room, the outdoor screen, or the location tag, information media permeate the built environment and form urban resource networks. At this scale, it becomes harder to study attention itself, yet easier to understand inhabitation and usability as one.¹

As mobile technology remakes attention at street level, it meets the embedded. Everyday transactions use and create long trails of data. New layers remake experiences of transit, shopping, basic utility connections, and, in some cases, even the allocation of housing. Although the usual image of smart cities has been wealthy and utopian, the more profound significance of their new information layers may lie in new living patterns across the multicentered urban archipelagoes sometimes known as “megacities.”² Active participation in emergent networks helps make local habits and routines comprehensible. Wherever people improvise organizations to get on with life amid the chaos of new settlement patterns, ambient information plays a part.

Many of these provisional arrangements provide access to infrastructure, identity to community, or opportunity for local business. Unlike global finance, which tends to operate in disembodied and disengaged ways, these ad hoc arrangements operate on the ground, in small transactions that can seldom be predictably formulated—maintaining, and sometimes even increasing, the kinds of human, social, or natural capital that remote corporations may not even recognize. As such, they demand new approaches of design, research, and interface arts. They also need a new name.

The Rise of Urban Informatics

Just thirty years ago, “smart city” meant “fashionable dress.”³ Just ten years ago, “smart grid” had yet to appear in the mainstream news media.⁴ And, less than a decade ago, the field of urban informatics first emerged. In 2006, the U.S. technology research journal *IEEE Pervasive Computing* organized a conference theme on *urban computing*, a term introduced by Eric Paulos, then at Intel Research.⁵ The following year, a workshop on “urban informatics” was held in Australia, and a research handbook by Marcus Foth published.⁶ The coinage “urban informatics” is often credited to the pioneering virtual communitarian Howard Rheingold, who foresaw the significance of street-level experience to digital culture.⁷ Rheingold was responding to the New York City Wireless Initiative and to the writings of William J. Mitchell, whose urban technology trilogy told of “teleserviced neighborhoods” and “computers for living in.”⁸

For architects, “smart city” means a departure from the algorithmically fabricated forms that have preoccupied most digital designers; for engineers, it represents a departure from all-powerful

handheld gadgets. In a 2006 interview with *Metropolis* magazine, Mitchell explained how the smart city is not all mobile; it also runs on new combinations with embedded intelligence: “A particularly powerful design strategy under these conditions is to look for the ways that embedded intelligence loosens traditional relationships and constraints, and seize these as opportunities for fundamentally reimagining a product or system’s organization, shape, and scale.”⁹ Thus the oft-cited MIT project for a new CityCar applied the battery capacity from racks of parked cars to citywide power storage balancing. Even everyday Zipcars demonstrate the network principle of product-service systems, nontragic commons, and productive combinations of mobile and embedded technologies.

“The real-time city is now real!” declared MIT’s SENSEable City Laboratory in 2011. “The way we describe and understand cities is being radically transformed—alongside the tools we use to design them and impact on their physical structure.”¹⁰ Among the lab’s many well-known projects, the Copenhagen Wheel (2009) combined energy harvesting, route selection, and ambient environmental data for bicyclists. After an interview with lab director Carlo Ratti, blogger Dan Hill described a “new soft city,” where “you can see real-time information along one slice, one axis, and this enables us to anticipate a future city where perhaps the majority of the urban activity will generate impossible swathes of real-time data.”¹¹ In his 2010 book, *Smart Things*, Mike Kuniavsky connected this phenomenon of “information shadows” with a more fundamental notion of “information as a material.” Both are evident in street-level resources such as Zipcar, or its bicycle counterpart, Velib. “Information processing no longer needs to be the purpose of an object, but is one of

many qualities that enables it to be useful and desirable in ways that are more directly related to people's wants and needs. In other words, information processing no longer defines the identity of an object, but is one of many materials from objects can be made."¹² To the visionaries of urban informatics mentioned here, these new materials and shadows become as intrinsic a part of embodied urban experience as tags, city lights, and media facades.

Over the last decade, hundreds of aspiring labs have produced thousands of street-level applications for arts festivals like ZeroOne and Ars Electronica. Research conferences such as those sponsored by *IEEE Pervasive Computing* increasingly accept smart city design project presentations. Burgeoning business conferences such as Where 2.0 test the entrepreneurial prospects of street-level location-based media. Interlink research policy initiatives from the European Union focus on "ambient computing and communications environments."¹³ Big technology corporations have entered the field as well. IBM, for example, now promotes "A Smarter Planet." In a white paper entitled "Smarter Cities for Smarter Growth," IBM asserted the importance of better information services to overall urban prosperity. The experience of using urban infrastructures has become an ever more crucial component of livability, as measured by, say, the Human Development Index. Seen from the top, where IBM provides consultation to policy makers and infrastructure builders, the challenge is to integrate. The city is a "system of systems," which integrates core services in transportation, health care, public safety, and public education. But even from the top, this challenge increasingly emphasizes bottom-up social phenomena. The way to integrate, the white paper asserts, is to

leverage the vast amount of existing data that accumulates in the course of everyday behaviors, and to make it "widely accessible to citizens."¹⁴

"Smart Grid will be bigger than the Internet,"¹⁵ Cisco's CEO John Chambers proclaimed in 2010 as his company joined the race to build new energy infrastructure. Pervasive computing pioneers have often pointed out that, like electrical power in the twentieth century, digital processing in the twenty-first has disappeared into everyday life. Arguably the core technology of modernity, electricity introduced such concepts as appliances, pay as you go, and the grid itself into popular consciousness.

Alas, the electrical grid suffers from excessively top-down control, with huge power plants and distribution networks administered as public utilities; and it has been astonishingly wasteful, not just in how it transmits power but also in how its end users apply that power. By many estimates, a third to a half of the electricity used in buildings in the United States is wasted, and, by most estimates, buildings surpass vehicles as producing the largest fraction of the nation's avoidable carbon emissions. Thus electricity now seems ripe for, as Internet strategists would put it, "distributed social production." Today's investors bet on smart grids; consumers become cogenerators; devices time their operations to help balance demand loads; lights turn themselves off when you leave the room; and organizations actively monitor and reconfigure their consumption patterns. And, as with electricity, so with many other aspects of everyday life.

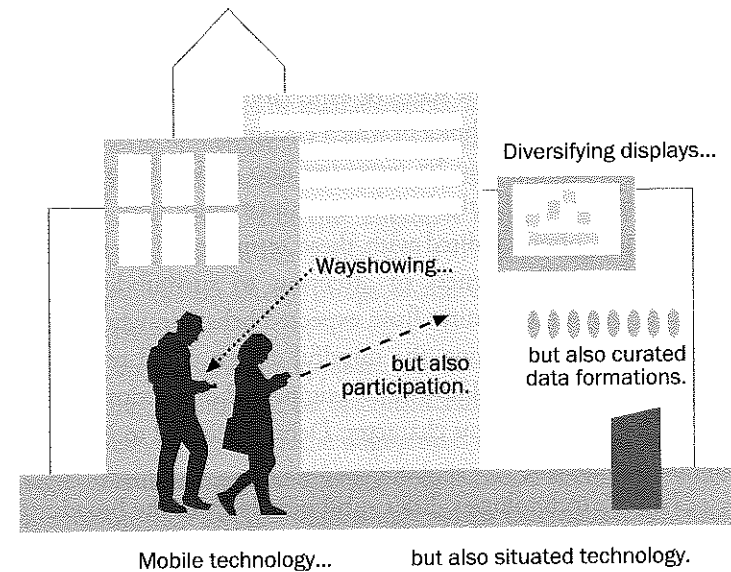
A more bottom-up approach to smart cities presents a new kind of design challenge. Just as electrification in the early twentieth century gave rise to a new discipline of industrial design, so smart, distributed, interoperable, data-intensive, citizen-accessible

urban infrastructure in the early twenty-first is giving rise to a new discipline of pervasive interaction design. “Street computing” provides another possible name for this shift. As explained by Marcus Foth, who has organized events and publications under this name, street computing at its core facilitates better bottom-up awareness of the city, making more systems queriable and programmable.¹⁶ As with electrification, this enables unforeseen appropriations and engenders new kinds of participation.¹⁷ In the words of Eric Paulos: “We need to expand our perceptions of our mobile phones as simply a communication tool and celebrate them in their new role as personal measurement instruments capable of sensing our natural environment and empowering collective action through everyday grassroots citizen science across blocks, neighborhoods, cities, and nations.”¹⁸

This participatory information stewardship transforms perceptions, both individual and social, of the city itself. Then, as urban usability constructs agreements to participate, to monitor, and to seek stewardship, it begins to take on aspects of a situated information commons.

A New Mental Map

With urban computing, “psycho geography” has entered a different era. Relations between embodied cognition, spatial mental maps, and explicit wayshowing systems now slip apart and recombine. From the perspective of architecture and urbanism, street-level media increase the importance of having worthwhile places to go. From the perspective of habitual attention, “worthwhile” means something more than momentarily amusing. In the rise of urban informatics, active participation supplants passive amusement (figure 9.1).



9.1 The basic idea of urban informatics.

“Psycho geography” was coined by the mid-twentieth-century situationists, whom today’s proponents of situated technology still read. Reacting to the politics of the broadcast monoculture, under which they saw the terms of viewing increasingly being furnished, the situationists proposed that the best way to step out of that monoculture was to engage physical space in unanticipated terms. The best way to do so was to walk a playful drift (*dérive*) among less-noticed things, to bring some of those things into telling juxtapositions (*détournement*) that would break the

spell of the politically engineered distractions (*spectacles*). To a situationist, play does not mean games with fixed rules so much as crossing in and out of states of expectation. This works better through serendipitous choice of which circumstances to ignore and which to exaggerate than by retreating into declared sets of personal preferences.¹⁹ To the best-known situationist, Guy Debord, who is most often credited with these terms, psychogeography cultivated a self-awareness of attention to surroundings. By means of playful departures from expected behavior, whether for personal or social reasons, the mindful citizen could repurpose situations, and so reveal how those engineered distraction.²⁰ This mindfulness had ambient character; Debord referred to it as “the ambiance of play.”²¹

Today’s technologies differ substantially from the broadcast media of the situationists’ era, of course. The monoculture that the situationists protested has dissipated. As noted in the chapter on screens, media have proliferated to the point where planned spectacles go unnoticed. The capacity to create spatial mental models hasn’t really changed, however. The body imposes a schema on space, and the arrangement of bodies in space expresses those schemas in society. Tacit knowledge of these configurations informs spatial mental models, whether of communities of practice, contested ground, or anonymous drift along avenues.

Also, as noted in the chapter on embodiment, elements of mental models become internalized and externalized by activity. According to first principles of anthropology, the experience of urban activity emphasizes interpersonal distance, spatial distributions of hierarchical orders, and sites of collective commemoration.²² Landmarks, districts, edges tacit and explicit, and nodes

among one or more infrastructures provide the building blocks of spatial mental models. These models often take the form of ever-adapting collages of such elements, and seldom occur just as tags on a two-dimensional projection like a Google map, or any single uniform Cartesian view. The most famous visualizations of these models might be the “cognitive maps” created by architects and planners in the 1960s and 1970s, the most original of which was the oft-cited “Image of the City” by urban planner Kevin Lynch.

Urban exploration applications in mobile and embedded computing should thus be of considerable interest to cognition researchers. Where does the augmented city amplify the advantages of embodiment, and where does it cancel them out? When mediation such as GPS increasingly assists externalization, what happens to internalization? How do social navigation and more overt declaration of interests and preferences reshape street-level serendipity? If, after a decade of street-level urban informatics, everyone were to put their technology away, would their city skills be higher or lower than they had been before the technology? Or does the infusion of space with so many media simply erase all spatial mental models? Does the covering of high-resolution intrinsic information with lower-resolution processed information reduce affordances or affinities for embodied cognition overall, and thus reduce the image of the city as well?

You might expect that personal choices about maintaining a sensibility to surroundings figure in this. The influence of technology on urban experience might depend on your attitude toward environment, information as a material, or perceptions of overload. All of which makes universalist media and their sociologies suspect.

You might also read the paradigm shift from virtual world-building to urban informatics as an optimistic indicator of continuing spatial affinities. The exercise of embodied cognition can be restorative. It can feel more natural than purely abstract symbol-processing skills. Urban informatics can tap latent spatial abilities. To Carlo Ratti, this makes it “more Spacebook than Facebook.”²³

In the principles of embodied cognition, participation itself is situated. Street computing doesn’t simply add a layer of portals to someplace else, but instead adds to cognition of the present place. It doesn’t command attention on one channel at a time, but instead interleaves media objects among themselves and with unmediated objects, and in effect becomes ambient. Sites, props, social contexts, and interpersonal protocols of conduct produce a sense of engagement, which surpasses solitary use of a handheld device on a universal network at providing a sense of belonging, learning, or craft. According to philosophers from many different ages, those habits of skilled, purposeful engagement make better citizens.²⁴

The casual, provisional arrangements of everyday life in the megacity remain elusive, however. Although the major builders of mobile and embedded technology have doubtless undertaken private studies of these arrangements, published studies such as the biennial working papers of Sri Lanka-based LIRNEasia on mobile technology practices at the bottom of the pyramid are few and far between.²⁵ A comprehensive street-level ethnography of media practices in the new megacities has yet to emerge. Because it would be difficult to find overarching unity in the currently sparse literature, for now, simply consider a few contrasting cases, particularly from the perspective of attention.

Wayshowing

When you combine a smartphone used as cursor with a positioning system such as GPS to look up nearby features, you get a “reality browser.” To browse is to discover possibilities along the way; to browse reality is to combine the use of labels and links with presence in the physical spaces they describe. That can’t happen in virtual spaces because a sense of presence depends on embodiment in haptic orientation and the inner ear. Now street-level media are available to help in the exercise of those. For someone who grew up being driven everywhere, street-level media may provide a necessary externalization, to be followed by internalization, of some basic city skills. This advances the centuries-old agenda of inscribing the city for incidental visitors.

Socially acceptable augmentations do exist. First off, most digital navigation is not to commercial offerings, but to friends. Social navigation now adds checking in to its moves. To declare your location on a social reality browser such as Foursquare lets unplanned encounters occur. To share tags and applications generates social life around particular activities and *dérives*, whether the active gaming of Parkour, the field identifications of plants or birds by naturalists, or the eccentric quests of collectors. Because a better wayshowing app makes systems of tags and labels available only to those who are interested, it helps urban explorers with filtering. The more that tags work as digital augmentations, the less they clutter physical spaces. On the other hand, such filtering serves to fragment the social sphere and creates new forms of digital divides.

Most people regard unfiltered, passive augmentations as little more than surveillance, which helps explain the generally negative view of pervasive computing. However, concern about

an Orwellian Big Brother may overlook a more real concern about just how many thousands of little brothers are skimming personal data. Consumer analytics have moved beyond your desktop click stream to your physical movements in the built environment. Retail planning was already a science of positioning; and now advertising, the discipline most adept at media placement, may use proximity and spatial movement pattern recognition to deliver messages into contexts where they are more likely to be noticed. Tracking may also employ sensors, even face-interpreting software, embedded into aisles and shelves. Thus the Quividi audience measurement service uses visual analytics to document how long you look at a particular display.²⁶ Target audio beam technologies allow a spoken message to be delivered to a precise location when triggered by a motion sensor.²⁷ Abuses of attention rights may have only just begun. In other words, the prevailing early trends of urban informatics as wayshowing do not bode well for a tangible information commons.

New Epigraphy

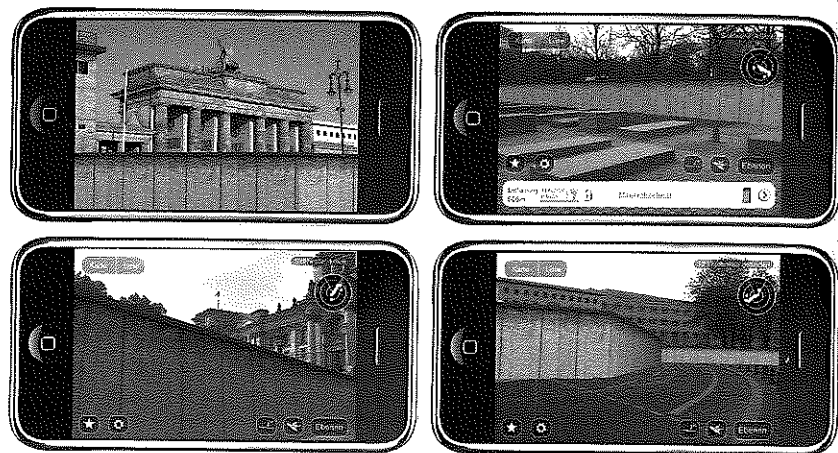
Researchers and critics alike advance an urban informatics based on participation. As explored in the chapter on tagging, a new middle ground emerges between official inscriptions and transgressive graffiti, which could be called the “new epigraphy.” New forms of annotation invite membership organizations, curation, and study.

Previous forms of signage have increased the usability of the city for the casual or unfamiliar visitor. But, for the resident, they are presumably unnecessary, and possibly an annoyance. The resident takes pride in awareness of changes to neighborhood

amenities and the everyday routes they establish. The resident makes more use of intrinsic information and takes many more objects and events as signs. These are often of neighbors, of the encroachment of unwanted developers (who tend to trample on unquantified forms of local value), or of the need for civic services. Thus the highly successful maintenance wish list site SeeClickFix, which uses “citizen” prominently in its mission statement, rallies residents: that one resident expresses concern about an amenity lets another care, too. Other hyperlocal aggregators work across a variety of interests; outside.in, a pioneering hyperlocal news service, aggregates bloggers by location, and establishes a mood of curating local lore.²⁸

Sound mapping works as urban storytelling, too. Tactical Sound Garden (TSG), another oft-cited project, demonstrated this process for the favored hotspot of Bryant Park, the birthplace of wireless Internet civics in New York City. Using three-dimensional positional technology, participants install a zone of audio overlays for browsing by anyone with headphones and a Wi-Fi device. Many such sound gardens develop on particular themes, such as local history, tagger culture, signspotting, or remembrance. TSG is currently an open-source toolkit for planning and “pruning” (modifying playback parameters) of sound gardens anywhere with good Wi-Fi coverage. A similar process works for images, incidentally. One famous Layar app lets you see images of the Berlin Wall in the context where it once stood, as shown in figure 9.2.

Much as networking has long allowed amateurs to become aggregators and producers of music and images, so now it allows them to gather environmental data. Thus, Living Light (figure 9.3) let participants text data to and from a park pavilion display



9.2 Reality browser: “Berlin Wall 3D” for Layar, Hoppala Agency, 2010.
Photo: Marc René Gardeya, Hoppala.

of accumulated energy usage data, which compared the present year to the previous one across the Seoul region. Projects like this raise a very good question: how do cultural curators of participatory urban annotation systems see their work in relation to traditional or physical aspects of a commons?

In the recent compilation *From Social Butterfly to Engaged Citizen*, which includes cases on food, traffic, gardens, radio, crowds, and membership organizations, several leading scholars have offered positions on the ethics of urban social computing.²⁹ Many of the participatory qualities of Web 2.0 become more significant when coupled with the activities of daily life. For, just as the attention costs of passive media and autonomous annoyances are greater when you can't click away from them, so the



9.3 Open-source ecofeedback: Living Light, Seoul, The Living, 2008.
Photo: Soo-in Yang.

benefits of active media and social networks feel greater when you apply them to shared physical environments.

Active participation in situated technology has most often taken the form of do-it-yourself (DIY) environmental monitoring. Participants sample, upload, map, and share data on pollutants such as carbon monoxide, surveillance cameras, invasive species, and noise. The Copenhagen Wheel project mapped levels of noise or air pollution by assembling geotagged data sampled by bicyclists as they moved around town. In an earlier instance of distributed sensing, Pigeon Blog (2006), took air samples from gas sensors and GPS readers attached, like paper messages of yore, to the legs of carrier pigeons.³⁰ Many such DIY monitoring projects now exist. “Turn your mobile phone into

an environmental sensor and participate to the monitoring of noise pollution,” invites NoiseTube, a Paris-based initiative sponsored by Sony.³¹

The use of personal communication devices to monitor, mix, and redistribute environmental data has a better name than “urban informatics,” namely “citizen science.” Eric Paulos, Ben Hooker, and R. J. Honicky introduced this term as an expression of empowerment.³² Phones become data instruments; streets become platforms; aggregations become open-source communities, such as the data infrastructure platform Pachubé (now Cosm). Reports and displays become public embellishments, often in ambient format, such as the data murals of water and energy usage in the Arup Bangaroo project in New South Wales, Australia, that Dan Hill helped produce. Citizen science, then, is a use of technology for tuning in rather than out. Urban computing becomes alertness, perhaps even resilience, and not mere entertainment. Paulos and colleagues assert what this is not: “Urban computing is not a disconnected personal phone application, a domestic networked appliance, a mobile route planning application, an office-scheduling tool, or a social networking service.”³³ Thus it is also not just for casual outsiders, such as tourists and advertisers. It is not personalized, nor is it as usable for beginners as it is for masters. With citizen science, new genres of urban data curation such as urban computing become a significant cultural domain.

U-City

Alas, too much occurs from the top down. Much of the rapidly urbanizing world is not so historic, civic, and complexly layered as a New York- or London-based flaneur or citizen scientist

might wish. In most any metropolis, the walkable core that attracts global business and tourism is surrounded by a far larger ring of less centralized conditions. For example, many of the huge estates going up outside Beijing are designed to manage as many of their own infrastructural needs as possible. Many of the smart cities that get so much airplay from their corporate stakeholders constitute a case as different from core-city wayshowing and neighborhood citizen science as these are from one another. Layering means less in places where nothing preexists and where the technological emphasis is on ubiquity instead of augmentation. Hardly the sites of postmodern cultural juxtaposition, these smart cities are exercises in late modernist cybernetics: digital nervous systems of command and control. Resource economics dictates this more than any drive toward political aggrandizement. A truly smart city would reduce some of the biggest logistical sources of carbon emissions, material waste, time delays, and emergency unpreparedness.

South Korea regularly lays claim to being the most networked nation on earth, as measured in rates of usage, availability, and capacity of its communications infrastructure. Seoul has demonstrated many everyday situated technology practices already: it is a leader in the use of QRC tagging; its Galleria West facade (2004) was among the earliest instances of programmable media facades. In remarkable contrast to the Parisian kiosks of the Victorian era (figure 9.4a), Seoul’s Gangnam District “media poles” (2009; figure 9.4b) provide new instances of the sidewalk arts and events kiosk, now in LED technology, at obelisk scale, 12 meters (40 feet) tall. So it was reasonable for South Korea to be the first country to lay claim to the expression “u-City” (with “u” for “ubiquitous”). According to Jong-Sung Hwang of the

9.4 Street kiosks then and now.



(a) Paris, ca. 1880, in painting by Jean Beroud (Walter Art Museum/Creative Commons).



(b) Gangnam District media poles, Seoul, seoulspace, 2009. Photo: courtesy of seoulspace.

National Information Society, no less than twenty-two u-City projects were under way at the height of the boom in 2007.³⁴ Korea's leadership in infrastructure, its need to balance the boom of Seoul with development elsewhere in the country, and its centralized practices of construction consortiums combined to push ubiquity as an aspect of cultural identity. In "Living on a Platform," a survey of smart cities in 2010, the *Economist* led with New Songdo City, the most-cited instance of full-scale cybernetic city building to date. In a Shanghai World Expo exhibit that year, the networking giant Cisco demonstrated "all the digital plumbing" underlying Songdo. For example, in a mockup command center, "visitors were given a demonstration of how city managers would react to an accident on a city-centre bridge: cameras zoom in, an ambulance is dispatched, traffic is rerouted to other bridges—all automatically, within seconds."³⁵

Today, post-economic crash, Songdo sits less than halfway completed, a self-evident critique of top-down urbanism from the standpoint of bottom-up arts and sciences. The everyday online media are filled with outpourings on Songdo and its ilk. Masdar, the United Arab Emirates project for a top-down smart green city, is mocked for being built on oil revenue and surrounded with the shantytowns of those who built it but can't afford to live there.

To anyone without a stake, such digital utopias may seem like technology for technology's sake. Or worse, a smart city can be a perfect dystopian union of technology, capital, and distracted urban subjectivity. So, by contrast, consider the introduction of media bottom up, on the other side of the economic and cultural divide.

Telecenters

Much experience of infrastructural access occurs in circumstances directly opposite those of any u-City: bottom up, under-capitalized, mostly undocumented, relatively low tech. Although access in these circumstances receives less systematic study, it needs to be recognized for its potential.

In particular, the mobile phone has brought network experience to far more city dwellers than any other technology. The economic advantages of connectivity, findability, and location may be all the greater to those with no other information infrastructures at hand and with no prospects for top-down investment or appropriation. Anthropologist and photoblogger Jan Chipchase has explored how this new bottom-up layer, often the first information infrastructure in a locale, relates to other resource networks and how it can show privileged digerati ways to develop without imposing technology for the less wealthy.³⁶ The models of use are not those of consumption, hurriedness, ubiquitous service and support networks, or the presumed constant need for entertainment. And, in contrast to the dislocated experience of developed global cities by digital nomads such as Chipchase himself, these bottom-up patterns can only be situated in material circumstances and the intrinsic information of things.

Consider the case of "tap attendants," who wait by an intermittently active standpipe for the water to run, and then manage the queue of customers with buckets to be filled, charging each customer a small fee. Nabeel Hamdi, a leading voice on participatory urban development, has remarkable stories about these everyday infrastructure workers, who are often children. In a corrupt situation, an attendant might pay the city a certain

amount from the fees collected in order to receive water at this standpipe only on his or her watch, and then surcharge customers for a more predictable outcome. Another such tap attendant service on the rise is the recharging of mobile phones, for a fee payable in minutes of phone service.

One way to avoid such gatekeeping is to put the infrastructure access in the open, usually through what are called “telecenters,” with governance bottom up among existing neighborhood or village councils, as in a commons. India began to install such telecenters around 2000, under an initiative named “Gyandoot,” in which a pilot project set up about forty of them, some as storefronts and some as roadside kiosks, each designed to serve a dozen or more nearby villages. The project received democracy-and-technology awards internationally. Soon the market took the kiosk telecenter format to a larger constituency. By 2007, there were some 6,000 e-Choupal telecenters in India. Whereas the state centers served mainly to get government information out to the villages, the private centers were more often operated business to business, sometimes as commons, especially for the benefit of farmers.

Operations and practices of the telecenters reflected the status and practices of appointed villagers. Terms of engagement differed from place to place and often improvised metaphors and tokens of use that were quite outside technologists’ expectations. For, as Paul Dourish and Genevieve Bell have observed, this fresh “experience of infrastructure” reveals patterns of culture: “We refer not simply to physical infrastructures but more broadly to infrastructures as fundamental elements of the ways in which we encounter spaces—infrastructures of naming, infrastructures of mobility, infrastructures of separation, infrastructures of interaction, and so

on.”³⁷ The telecenters revealed the complementary nature of technical and social patterning.

When it comes to the economics of attention, megacity resource networks behave quite differently from more familiar patterns of media consumption. For one thing, there must be intrinsic information in an urban resource commons, as well as social sensemaking and physical mise-en-scène. Neighborhoods that are undercapitalized fiscally may use new networking technologies to apply other, nonfiscal kinds of capital, such as cultural customs of access and use. Thus the kiosk telecenter format has been put to use by larger organizations such as the housing rights coalition Slum and Shack Dwellers International (SSDI), which now operates in thirty-three countries. In contrast to the “bottom of the pyramid” metaphor used by market analysts, which presumes that higher outside forces will be the main instigators and beneficiaries of resource schemes, this networked commons metaphor presumes that millions of local organizations will uphold locally intrinsic value better, and thus provide advantages that larger, more remote markets and states simply can’t.

Well-meaning outsiders need to research such topics in greater depth, but they also need to proceed with caution. The cultural workings of attention may reveal which technology appears advantageous, and which is merely a contrivance. Whereas, in the most highly developed cities, there is a danger of romanticizing the technology, in the less developed ones, there is a danger of romanticizing the anthropology.

Urban Resource Partnerships

Can urban computing lay the cultural groundwork for other tangible information commons? What would it take to spread best

practices into more cities, across more social divides, and into more resource pools? Even the small set of cases here suggests a larger prospect. Urban resource partnerships take on aspects of commons. As the economist Elinor Ostrom explained: “The key to a more effective [commons] model is to encourage self-organized contracts between local participants in context.”³⁸ As the street-level media pioneers Julian Bleecker and Nicholas Nova have explained, the patterns of use that gather around shared streams of public environmental data make them into tangible social objects that are more accessible to casual social attention.³⁹

Cases already exist in water quality, biodiversity, energy leaks, and the right to see the dark night sky.⁴⁰ Economists of networked social production have shown how nonmarket, non-governmental organizations can help realize the value, and not just the fiscal value, of hyperlocal resources, and not just material resources, but also the kinds measured by the Human Development Index.⁴¹ The dynamics of housing, water, power, transit, currency, opportunity, expertise, public health, and environmental health—these have become the agenda in urban computing.

How the ambient truly becomes a commons may take a lifetime to discover. Some already apparent aspects of the way forward, including changing notions of commons itself, deserve more inquiry in the chapter ahead. But before turning to that, another, perhaps even more fundamental aspect of urban computing as psychogeography deserves emphasis here. After all, media do not simply annotate a preexisting city but also help create new understandings, uses, and tacit geographies of the city. So this is really a question of attention to surroundings, and that is a fundamental theme in urbanism.

Distraction Reconsidered

This inquiry into attention gains perspective from an environmental history of information. In an age of embodied information, seen here from the perspective of participatory urban computing, age-old expectations about distracted urban life may no longer seem quite so accurate. There has been a change in the nature of distraction.

Although it may always have existed, and by now the advertising industry has made it seem nearly universal, an attitude of distracted irreverence once was less usual, and the topic of a new sociology. Scholars of a mindful, resistant urbanism still recite Georg Simmel’s 1903 portrait of distraction, “The Metropolis and Mental Life,” in which “there is perhaps no psychic phenomenon which is so unconditionally reserved to the city as the blasé outlook.”⁴² Presciently, but not so uniquely, Simmel saw money steadily replacing all other forms of social exchange (a process that continues today in what social media tycoons now call “monetization”). Like other early sociologists, he saw a steady decline in everyday opportunities for spontaneous personal engagement, as city dwellers dealt more with strangers, identified less with groups, spent much more time alone, and worked as cogs in some giant machine.

For as postmodern critics so often protested, visual culture itself industrialized; and in the process, so did attention. The interplay of distraction and attention only took modern form in the last third of the nineteenth century. That is when William James began to explore it, for one. Industrialization had made attention into something to pay, not only when attending factory machines, but also with respect to visual culture. As art historian Jonathan Crary observed, “modern distraction was not a

disruption of stable or 'natural' kinds of sustained, value-laden perception that had existed for centuries but was [instead] an effect, and in many cases a constituent element, of the many attempts to produce attentiveness in human subjects."⁴³ Through careful reading of both early texts of the then-formative discipline of psychology and selected paintings from the period, Crary was able to identify attention as a new idea. "Not until the 1870s does one find attention consistently being attributed a central and formative role ..."⁴⁴

In what became his more lasting, unique contribution, Simmel reacted against this new sense of attention. Whereas "anomie," introduced by his more influential contemporary, Emile Durkheim, conveyed a general sense of disconnected outlook, "blasé" and its English equivalents "blunted" and "dulled" expressed it in more personal, perceptual terms. In a fittingly industrial metaphor, "blasé" means worn down through excess, not only from the labor or pollution that many sociologists protested, but also from unprecedented diversity of demands on attention, or as Simmel put it, "incapacity to react to new stimulations with the required amount of energy."⁴⁵

This incapacity arises from the need to shift attention quickly and often. In what may be the most famous passage from "The Metropolis and Mental Life," the fatigue that dulls and blunts comes from "the intensification of nervous stimulation, resulting from the rapid telescoping of changing images, pronounced differences in what is grasped at a single glance, and the unexpectedness of violent stimuli."⁴⁶ Or, in another translation, it results "from the rapid crowding of changing images, the sharp discontinuity in the grasp of a single glance, and the unexpectedness of onrushing impressions. These are the psychological conditions

which the metropolis creates." Long before handheld communications, outdoor video, or electronic ink, the flood of stimuli was enough to make distinctions among its elements vanish, giving rise to city dwellers' characteristic "blasé attitude," whose "essence" Simmel described as "an indifference to the distinctions between things."⁴⁷

Although Simmel's larger work on political economy has been largely forgotten, his particular focus on dulled subjectivity eventually resonated with the late twentieth-century critics, who revived him.⁴⁸ As consumerism reached unprecedented levels in the 1980s, Simmel seemed far ahead of his time on the experience of fragmented, decontextualized, desire-inducing media. Postmodernists found Simmel's essayistic, anticomprensive style appealing.⁴⁹ For, as they would have put it, the blasé privileged the reader. They agreed how the response of city dwellers to the readymade life, its furnished worldviews, and its endless overstimulation, was to become highly arbitrary and distinct in one's tastes.⁵⁰ The unprecedented material benefits (electricity, sanitation, transit, communications) that modern cities provided their citizens made that possible.⁵¹ Although distraction and overload could occur in any culture, modernity offered more means to become comfortably numb. Or, in Simmel's words: "as a protection of the inner life against the domination of the metropolis, the reaction of the metropolitan person to those events is moved to a sphere of mental activity which is least sensitive and which is furthest removed from the depths of the personality."⁵²

Today, the onrushing impressions have become more numerous, more subtle, and more widely distributed than in Simmel's time. This is the usual qualification that twenty-first-century critics make to the argument that people have always

experienced overload. Yes of course they have, but not so often, not in so many different aspects of everyday life as now, and not by such easy means. The harsh industrial distractions of city life have waned; there are fewer things belching steam, soot, and noise at such intensity. Today, much more in the flood of stimuli takes the form of intentionally produced, subtly appealing or entertaining, widely distributed media productions. You may experience ever more of these productions involuntarily, in part because they so pervade the activities of your lives that despite all diligence you cannot keep up with the filtering. But then, more significant to this inquiry, the flood of stimuli also occurs at street level, where it is even more difficult to escape.

In short, never has distraction had such capacity to become total. Enclosed in cars, often in headphones, seldom in places where encounters are left to chance, often opting out of face-to-face meetings, and ever pursuing and being pursued by designed experiences, postmodern posturban city dwellers don't become dulled into retreat from public life; they grow up that way. The challenge is to reconnect.

Meanwhile, the experience of information overconsumption has developed a much more participatory, social infrastructure. Simmel was witnessing the rise of one-to-many commercial media, albeit before electronic broadcast technologies brought them to the center of everyday life. The postmodernists who revived Simmel were witnessing the absurd extremes at the end of one-to-many media dominance—the 1980s were the last decade of television monoculture. And the urban computing pioneers who today translate an interest in Simmel forward to the age of personal street-level media are witnessing the rise of many-to-many, or what some call “read/write” urbanism. Where

an ethics of street computing engenders citizen science and notions of commons, the microstructure of engagement stands in dramatic contrast to the disengagement of city dwellers dulled by mass media.

In sum, a different sense of overload seems inevitable at each different stage in the history of environment, information, and technology. To someone displaced from traditional rustic life, where that tradition seems recent and memorable enough for constant comparison, urbanism amplifies the sense of displacement, or anomie. To someone who grew up in postindustrial sprawl, with disembodied friendships, nonstop media feeds, and informational empty calories, urbanism represents a prospect for relative sanity, or at least a richer mix of perceptual options, and a better balance among information about, for, and as the world.

This voluntarily urban citizen prizes attention skills, defends attention rights, and takes time for attention restoration. And that seems quite different from sitting alone, grazing on favorite feeds, and hoping not to miss any messages. It also seems different from Simmel's shock at the newly electrified Berlin. Overstimulation may be more subtle, widespread, and appealing than before, but blasé has become less of an option. Those who go blank become only more vulnerable to thoughtless overconsumption, even attention theft. Instead, the best defense is to choose to take interest, and to help your sensibilities slowly evolve.

How newer megacities now urbanize will have more impact than what the existing metropolises do next. This process is much more difficult to study, to capture with art installations, or to read or write books about. Millions of people now network their local resources, organize governance where markets and

states have missed doing so, uphold nonfiscal capital in nontraditional ways, use embodied media to form their images of the city, and so recast their workings of attention.

9. MEGACITY RESOURCES

Main idea: Urban computing inevitably transforms attention to context

Counterargument: Don't impose technology
Key terms: Urban informatics, psychogeography, resource networks

What has changed: Bottom-up economics of rapid urbanization

Catalyst: More kinds of resource organizations

Related field: Smart cities

Open debate: Non-market networked production?

Environmental History

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Information deserves its own environmentalism. The more that information technology permeates everyday life, the more inescapably it alters personal and cultural sensibilities. Of course, the physical patterns of everyday life can be just as telling as a culture's art or politics. Thus, one culture, whose citizens variously walk, ride bicycles, drive cars, and take streetcars to get from place to place, might assume they need little instruction to share the streets, whereas another, whose citizens almost always move around in cars, might need plenty of signage, and might sometimes use parking restrictions to avoid unanticipated social mixing. To understand such cultural differences, it can help to see their many usage patterns as a landscape. It can also help to see cultural landscapes in historical perspective. It can help to see such larger patterns as "cultural landscape." In a widely-read definition of landscape, the design critic Paul Shepherd once advised that "the big moves in [a cultural] landscape happen very rarely. You will be lucky to see one during your lifetime

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Attention in the Age of Embodied Information

Malcolm McCullough

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